



**SIM TECHNICAL REVIEW PROCESS FOR ELECTRICITY AND MAGNETISM
CALIBRATION AND MEASUREMENT CAPABILITY**

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SIM review process consists of two parts: a technical review and a quality system review. This document covers only the technical review process for Electricity and Magnetism Calibration and Measurement Capabilities (EM CMCs).

1. Calibration and Measurement Capability

In the context of the CIPM MRA and ILAC Arrangement, and in relation to the CIPM-ILAC Common Statement, the following shared definition was agreed upon http://www.bipm.org/utis/common/CIPM_MRA/CIPM_MRA-D-04.pdf :

***“A CMC is a calibration and measurement capability available to customers under normal conditions:
(a) as published in the BIPM key comparison database (KCDB) of the CIPM MRA; or
(b) as described in the laboratory’s scope of accreditation granted by a signatory to the ILAC Arrangement.***

Where the term NMI is used it is intended to include Designated Institutes (DIs) within the framework of the CIPM MRA.”



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NOTES

N1. 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. The terms BMC and CMC should be interpreted similarly and consistently in the current areas of application.

N2. Under a CMC, the measurement or calibration should be:

- performed according to a documented procedure and have an established uncertainty budget under the management system of the NMI or the accredited laboratory;
- performed on a regular basis (including on demand or scheduled for convenience at specific times in the year); and
- available to all clients.

N3. The ability of some NMIs to offer “special” calibrations, with exceptionally low uncertainties which are not “under normal conditions,” and which are usually offered only to a small sub-set of the NMI's clients for research or for reasons of national policy, is acknowledged. These calibrations are, however, not within the CIPM MRA, cannot bear the equivalence statement drawn up by the JCRB, and cannot bear the logo of the CIPM MRA. They should not be offered to clients who then use them to provide a commercial, routinely available service. Those NMIs which can offer services with a smaller uncertainty than stated in the database of Calibration and Measurement Capabilities in the KCDB of the CIPM MRA, are, however, encouraged to submit them for CMC review in order to make them available on a routine basis where practical.

N4. Normally there are four ways in which a complete statement of uncertainty may be expressed (range, equation, fixed value and a matrix). Uncertainties should always comply with the Guide to the Expression of Uncertainty in Measurement (GUM) and should include the components listed in the relevant key comparison protocols of the CIPM Consultative Committees. These can be found in the reports of comparisons published in the CIPM MRA KCDB as a key or supplementary comparison.

N5. Contributions to the uncertainty stated on the calibration certificate and which are caused by the client's device before or after its calibration or measurement at a laboratory or NMI, and which would include transport uncertainties, should normally be excluded from the uncertainty statement. Contributions to the uncertainty stated on the calibration certificate include the measured performance of the device under test during its calibration at the NMI or accredited laboratory. CMC uncertainty statements anticipate this situation by incorporating agreed-upon values for the best existing devices. This includes the case in which one NMI provides traceability to the SI for another NMI, often using a device which is not commercially available.

N5a. Where NMIs disseminate their CMCs to customers through services such as calibrations or reference value provision, the uncertainty statement provided by the NMI should generally include factors related to the measurement procedure as it will be carried out on a sample, i.e., typical matrix effects, interferences etc. must be considered. Such uncertainty statements will not generally include contributions arising from the stability or inhomogeneity of the material. However, the NMI may be requested to evaluate these effects, in which case an appropriate uncertainty should be stated on the measurement certificate. As the



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uncertainty associated with the stated CMC cannot anticipate these effects, the CMC uncertainty should be based on an analysis of the inherent performance of the method for typical stable and homogeneous samples.

N5b. Where NMIs disseminate their CMCs to customers through the provision of certified reference materials (CRMs) the uncertainty statement accompanying the CRM, and as claimed in the CMC, must indicate the influence of the material (notably the effect of instability, inhomogeneity and sample size) on the measurement uncertainty for each certified property value. The CRM certificate should also give guidance on the intended application and limitations of use of the material.

N6. The NMI CMCs which are published in the KCDB provide a unique, peer reviewed traceability route to the SI or, where this is not possible, to agreed - upon stated references or appropriate higher order standards. Assessors of accredited laboratories are encouraged always to consult the KCDB (<http://kcdb.bipm.org>) when reviewing the uncertainty statement and budget of a laboratory in order to ensure that the claimed uncertainties are consistent with those of the NMI through which the laboratory claims traceability.

N7. National measurement standards supporting CMCs from an NMI or DI are either themselves primary realizations of the SI or are traceable to primary realizations of the SI (or, where not possible, to agreed - upon stated references or appropriate higher order standards) at other NMIs through the framework of the CIPM MRA. Other laboratories that are covered by the ILAC Arrangement (i.e. accredited by an ILAC Full Member Accreditation Body) also provide a recognized route to traceability to the SI through its realizations at NMIs which are signatories to the CIPM MRA, reflecting the complementary roles of both the CIPM MRA and the ILAC Arrangement.

N8. Whereas the various parties agree that the use of the definitions and terms specified in this document should be encouraged, there can be no compulsion to do so.

2. Scope

This SIM MWG-1 Guidance Document specifies requirements and the procedures for reviewing EM CMCs declared by NMIs being Member or Associate of SIM under CIPM's *Mutual Recognition Arrangement of national measurement standards and of calibration and measurement certificates issued by national metrology institutes* (CIPM MRA) (<http://www.bipm.org/en/cipm-mra>).

The EM CMCs of each NMI are published after final approval in Appendix C of the BIPM key comparison database (KCDB), maintained by the BIPM and publicly available on <http://kcdb.bipm.org>. In order for EM CMCs to be approved for publication in Appendix C, they must first be reviewed and approved by the SIM Electricity and Magnetism Metrology Working Group (SIM MWG-1). Once this approval is obtained, EM CMCs undergo an interregional review, where TC/WGs from other RMOs verify that the JCRB *Criteria for acceptance of data for Appendix C* (http://www.bipm.org/utis/common/CIPM_MRA/CIPM_MRA-D-04.pdf) have been followed, thus providing the technical confidence required for publication.



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3. Drawing up EM CMC files

The following rules should be followed to ensure the reliability of the information included in Appendix C of the CIPM MRA (<http://kcdb.bipm.org>).

It is essential that the submissions are performed by following the prescribed formats to allow the upload in Appendix C of the data reviewed and approved.

A template for the CMC Excel file can be downloaded from http://www.bipm.org/en/committees/jc/jcrb/cmc_excel_files.html

Appendix C of the CIPM MRA provides information contained in the "white part" of the CMC Excel files, namely "Calibration and measurement service" (Columns A-C), "Measurand level or range" (Columns D-F), "Measurement conditions/independent variable" (Columns G-H), "Expanded uncertainty" (Columns I-M), and in the column of comments (Column U) on the CMC entries. Three additional columns are also needed: the yellow column including the NMI acronym (Column S), the yellow column including the NMI service identifier (Column Q, not mandatory to be filled) and the yellow column including the service category (Column R) drawn up from the *Classification of Services in Electricity and Magnetism* which can be downloaded from http://kcdb.bipm.org/appendixC/EM/EM_services.pdf. The remaining columns, especially the "blue part" and any additional columns of information useful for the regional and interregional review are for review purposes only and are not part of Appendix C of the CIPM MRA.

General instructions for drawing up CMCs are presented in *Calibration and Measurement Capabilities in the context of the CIPM MRA – Document CIPM MRA-D-04* which can be downloaded from http://www.bipm.org/utis/common/CIPM_MRA/CIPM_MRA-D-04.pdf.

Particular instructions for drawing up CMCs in the EM field can be found in *Electricity and Magnetism Supplementary Guide for Appendix C of MRA*. Additional instructions are in *Instructions for Uncertainty Matrices in CMC Files*. Both can be downloaded from http://www.bipm.org/en/committees/jc/jcrb/cmc_excel_files.html

There are two different cases to be taken into consideration:

- CMCs files from an NMI that has not previously submitted EM CMCs (New CMCs);
- CMCs files that imply the modification or expansion of EM CMCs already approved.



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The documents cited above provide guidelines for both new CMCs and modification or expansion of CMCs already approved.

Modifications of a published CMC usually arise for reasons falling into one of three categories:

- a) material or editorial errors and improvements to the explanatory text
- b) increase of the uncertainty or reduction in scope
- c) change of the method of measurement or reduction of the uncertainty or increase in scope.

For modifications of categories a) and b), the intra- and inter-RMO reviews are unnecessary. The NMI will send its proposal for change to the SIM WG Chair, who will contact the coordinator of the BIPM database. If an NMI decides to withdraw CMCs from the BIPM database, the same procedure will be applied. Modifications under category c) should follow the full procedure of intra- and inter-RMO review presented here, as if they were new CMCs.

The process for modification or expansion of CMCs already approved starts by the NMI CMC coordinator requesting the SIM WG chair to download the Excel file of the CMCs already published in Appendix C of CIPM MRA from the “Get Published part” of the access-restricted JCRB CMC website (<http://www.bipm.org/en/committees/jc/jcrb>). It is important to start modifying or expanding the CMCs from that file. This will avoid many future communication problems. The Excel hide/unhide function shall be used to hide those CMC entries that are not changing, so that only those changing (and those to be deleted) will be visible to the reviewers. In this way, only those entries that require the attention of the reviewers will be shown, and all the entries can be made visible when there is need to show the complete set of CMCs.

4. Intra-regional Review of EM CMCs

The way in which the SIM EM CMC review is carried out is the responsibility of the SIM MWG-1. However, the SIM MWG-1 should establish mechanisms to ensure that the review follows the rules of the *Joint Committee of the Regional Metrology Organizations and the BIPM* (JCRB). The present section covers the process for the review from the moment the SIM EM CMCs are submitted to the SIM MWG-1. Section 5 presents the timelines for the intra-regional review. Section 7 covers the SIM submission for publication in Appendix C of the CIPM MRA. SIM review of EM CMCs from other RMOs is discussed in section 8. The criteria for acceptance by SIM MWG-1 of EM CMCs from SIM or from other RMOs are presented in section 6. Section 9 presents the timelines for the interregional review.



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There is one SIM EM CMC review cycle per annum. A workshop on “Formulation and Review of EM CMCs” is preferably to be held each year in conjunction with a SIM MWG-1 meeting to discuss the template entries, expectations of supporting evidence, and the SIM and interregional review processes. The SIM WG chair issues a call for CMCs for the upcoming cycle to participants with a due date for their submission.

Direct participation in the MRA is limited to NMIs who have signed the MRA as the NMI of a member State of the Meter Convention or who have agreed to participate in the MRA through an RMO as the NMI of an Associate State of the CGPM. NMIs submitting CMCs should have a designated CMC coordinator who will act as coordinator for that NMI. Each NMI should submit its CMCs proposed for Appendix C of the MRA directly to the SIM WG chair. Submission of CMCs for SIM review starts when the SIM MWG-1 acknowledges the receipt of the CMCs. As the CMCs will be reviewed by different persons according to the specific service category (see below), it is not necessary to send the complete CMCs at the outset. CMCs for each service category can be sent gradually for review if the NMI judges appropriate to do so.

Though all members of the SIM MWG-1 are encouraged to participate in the review process, the technical basis of the EM CMC submissions from each NMI will be mainly reviewed by a group of experts from signatories of the MRA appointed by the SIM MWG-1. The participation in the technical review is not restricted to those NMIs listed in Appendix A of the MRA (<http://kcdb.bipm.org>), even though only those have the right to vote. Both a reviewer and a deputy reviewer for each service category are to be appointed by the SIM MWG-1 for a two-year period. (CMC reviewers and their deputies should work as closely together as feasible in order to facilitate the succession, especially when the reviewer may not be available.) The CMC submissions from each NMI are grouped into service categories and distributed to the corresponding reviewers. A copy of the correspondence is sent to all NMI CMC coordinators and the SIM Technical Committee (TC) chair for acquaintance.

The reviewers (or their deputies in specific cases when the primary reviewers are unable to report) will add three columns, named “Review Status”, “Reviewers’ Comments” and “NMI Response” (of course only if those were not available by the time they received the CMCs for review), all of them headed by an umbrella column named “SIM Review”. The intra-regional review must cover all submitted CMCs, sample review will only be accepted for the interregional review. They will then contact the NMI CMC coordinator for any interpretation doubts, inconsistencies with the CIPM MRA requirements that are identified, reports of comparisons that support the CMCs presented (if they are not available in Appendix B of the CIPM MRA <http://kcdb.bipm.org>) and other missing information, or additional actions that should be taken.

Reviewer’s questions or interpretation doubts and corresponding answers from the submitting NMI can be exchanged by email. The NMI CMC coordinator will keep a record of all emails exchanged and all the CMC files updated during the review. Once a basic understanding of the CMCs has been reached by the reviewer, all the subsequent comments to a given CMC entry should preferably be summarized by filling in the corresponding cell of the “Reviewer’s Comments” column. The NMI CMC coordinator or the NMI expert



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responsible for that service category will then respond to the reviewer's comments in the appropriate cell of the "NMI Response" column. Finally, the reviewer will decide on the approval or not of the given CMC entry by assigning a specific code in the corresponding cell of the "Review Status" column:

- a) OK – Reviewer's name – Reviewer's NMI acronym: The claimed CMC entry is judged to be consistent with relevant information, as indicated above.
- b) UNDER REVIEW – Reviewer's name – Reviewer's NMI acronym: This code refers to all the remaining cases. These include CMC entries that have not yet been examined by the reviewers, those for which more evidence is needed, and those for which the reviewers have raised an objection, but the issue has not yet been resolved. Once the review is completed, the CMCs coded UNDER REVIEW are expected to be coded as OK. An alternative approach that has also been accepted is to leave blank the "Review Status" column cell for a given CMC entry when it is under review.

Sometimes, the reviewer may prefer to send the CMC file to the SIM WG chair. In this case, the SIM WG chair will immediately transfer the document to the NMI CMC coordinator. The reviewer will be notified of this transfer.

Based on such discussions, the NMI may modify its CMCs submitted, or withdraw its submission. If the NMI decides to submit its CMCs without resolving the inconsistencies or completing the actions recommended, this will be noted and the CMCs will continue to be classified as "under review". If that is the case, the SIM WG chair will contact the interested parties and try circumventing the constraint, since only those entries for which an agreement has been reached are to be submitted to interregional review for approval. If, even so, the WG chair does not succeed, the issue may be discussed by another group of experts specifically appointed by the SIM MWG-1 to finally decide if the CMCs are to be approved or withdrawn.

The review process is expected to be finished within 50 days (except for those cases in which an extension of the deadline is accorded among the SIM WG chair, the NMI CMC coordinator and the reviewer). The WG chair will follow up, keep a record of the CMCs sent to him, and collaborate by conducting discussions among the interested parties when applicable.

Once the discussions and any modifications have been completed, and the CMCs reviewed for each service category, the NMI CMC coordinator will forward to the SIM WG chair the final version of the CMCs containing all comments from the reviewers, responses from the NMI (reference to dates of emails exchanged may be made if deemed necessary), and final approval by the reviewers.

Only CMCs that are supported by a fully-implemented quality system, reviewed and approved by SIM may be submitted for interregional review. All SIM submissions for publication in Appendix C of the CIPM MRA must be accompanied by a declaration from the SIM Quality System Task Force (SIM QSTF) **chair**, attesting that this requirement has been met.



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5. Timelines for Intra-regional Review

The reader should follow the flowchart in Appendix 1.

- i. Receipt of CMC tables from SIM NMIs – The SIM WG chair sends the notice of a new CMC review and the file set of new or modified CMC tables to the NMI CMC coordinators and to the SIM assigned reviewers. This includes a date when the SIM review needs to be completed, 50 days from the present date.
- ii. Reviewers respond to the SIM WG chair either agreeing to review the CMCs or declining some or all. This should occur within 5 days.
- iii. WG chair assigns new reviewers if necessary, starting with the secondary reviewer if possible.
- iv. Reviewers study the CMC changes (color coded) and determine those which are OK, and which are in question (requiring an exchange of information with the submitting NMI). They should make direct contact with the submitting NMI's CMC coordinator and technical expert for any CMCs in question, by e-mail copied to the SIM WG chair and their own NMI CMC coordinator. This first contact message should describe the CMCs in question and the issues concerning those CMCs. This message should be sent within 20 days of receipt of the CMC tables.
- v. The CMC reviewer should request a response within 10 days, and should review the response as soon as possible after it is received. If the issues are not yet resolved they should reply immediately to the submitting NMI's CMC coordinator or technical expert. If possible, all technical issues should be resolved by 35 calendar days after the receipt of the CMC tables. If any issues are not resolved by this time, the reviewer should notify the SIM WG chair, their own NMI CMC coordinator, and the submitting NMI's CMC coordinator, as well as the NMI technical expert. The SIM WG chair should explain to everyone that if the issues cannot be resolved within 10 additional days the CMC(s) in question will not be approved.
- vi. By 45 days after receipt of the CMCs, all reviewers should either approve or not approve all those CMCs that they have agreed to review, and send their completed CMC files to the submitting NMI CMC coordinator. The NMI coordinator should combine the reviews, save them, and send the reviewed CMC files to the SIM WG chair.
- vii. These sets of files should be sent to the SIM WG chair by day 50. The WG Chair will be receiving similar reviewed CMC sets from other NMI CMC coordinators. The WG chair should create a SIM report with a summary of the results for all submitting NMIs, and upload this and any other required NMI QS documents along with the reviewed CMC tables to the BIPM KCDB, which will eventually reach all the RMO TC-EM chairs in charge of the interregional review by day 60.



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6. Criteria for Acceptance of CMCs

The reviewers will check the CMC file of the submitting NMI for consistency with the following:

- a) General instructions for drawing up CMCs (http://www.bipm.org/utis/common/CIPM_MRA/CIPM_MRA-D-04.pdf);
- b) Additional instructions for drawing up EM CMCs and uncertainty matrices (http://www.bipm.org/en/committees/jc/jcrb/cmc_excel_files.html);
- c) EM CMCs already published by the NMI in Appendix C of the CIPM MRA (<http://kcdb.bipm.org>), when available.

The reviewers will then check the range and uncertainty of the submitted CMCs for consistency with information from some or all of the following sources:

- d) key and supplementary comparisons listed in Appendix B of the CIPM MRA (see <http://kcdb.bipm.org>);
- e) other multilateral or bilateral comparisons;
- f) knowledge of technical activities of the NMI, including publications or personal knowledge obtained by visits or other means;
- g) on-site peer-assessment reports;
- h) discussion between the reviewers and responsible scientists within the NMI;
- i) performance of equipment currently used;

While the results of key and supplementary comparisons are the ideal supporting evidence, all other sources listed above may be considered to underpin CMCs not directly related to the available comparison results and those for which comparison results are not yet available.

The NMIs that issue the CMCs are primarily responsible for providing the SIM MWG-1 with the information that they believe is necessary to support their claims.



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Though recognizing that the implications of the comparison results on published CMCs is the responsibility of the participating NMIs, the reviewer will preferably check the CMCs of the submitting NMI for agreement between the results of the EM comparisons and the entries for similar EM levels claimed by the submitting NMI. The comparison results consist of the difference from the comparison reference value (CRV) at each EM level and its associated expanded uncertainty with coverage factor $k = 2$. The reviewer will compare these benchmark *differences and uncertainties* to the CMC entries for the same EM level and measurement technique. Presumably, a CMC uncertainty should be approximately as large as its uncertainty in the comparison if the method used by the NMI is substantially the same and if the comparison achieved its goal of benchmarking the participants' capabilities.

NMIs that do not hold primary standards or primary measurement capabilities are required to have traceability to the SI (or if not yet feasible to another internationally agreed reference) of their national standards or measurement capabilities established through the BIPM or through adequate calibration services of another NMI or other designated institute published in Appendix C of the CIPM MRA (<http://kcdb.bipm.org>).

A CMC entry shall not have its traceability based on equipment calibrated by an accredited commercial laboratory, unless the latter is a designated institute listed in Appendix A of the CIPM MRA (<http://kcdb.bipm.org>). However, calibration certificates from such laboratories may be allowed for auxiliary equipment whose contribution exerts a negligible influence on the total combined uncertainty for the CMC entry.

It is deeply recommended that the reviewer (or the NMI CMC coordinator) avoid making reference to a given CMC entry by writing its Excel file row number in the “Reviewer’s Comments” column (or the “NMI Response” column). The CMC file may change significantly during the review process. Some reviewers may, for instance, request the suppression of several Excel file rows and their replacement by matrices (http://www.bipm.org/en/committees/jc/jcrg/cmc_excel_files.html), which will render obsolete many of those Excel file row numbers referenced previously.

7. Submission for Publication in Appendix C of the CIPM MRA

Each SIM submission for publication in Appendix C of the CIPM MRA (<http://kcdb.bipm.org>) may contain CMCs from one or several NMIs belonging to the same EM field. Once a group of (one or several) NMI CMCs has been approved in the intraregional review and a declaration has been provided by the SIM QSTF concerning its quality system status, the SIM WG chair will summarize the review results in a report and then start the SIM submission for publication in Appendix C of the CIPM MRA. This will occur once in a period of one or two years in order not to overload the other RMOs. All interested parties including the SIM TC chair are to be informed about the submission.



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The process leading to the publication of the SIM submission in Appendix C of the CIPM MRA is described in *Calibration and Measurement Capabilities in the context of the CIPM MRA – Document CIPM MRA-D-04* (http://www.bipm.org/utils/common/CIPM_MRA/CIPM_MRA-D-04.pdf). That document covers the process followed for the review from the moment that the SIM submission (comprising the NMI CMCs reviewed by SIM, the SIM QSTF declaration and the SIM MWG-1 report) is uploaded in the CMC web page of the JCRB.

EM CMCs submitted for publication in Appendix C of the CIPM MRA are accompanied by a SIM MWG-1 report attesting that the working group has approved the range and uncertainty of the CMCs. The report may include:

- a) Months between which the SIM review of the EM CMCs was carried out;
- b) Number of submitting NMIs comprising the SIM submission;
- c) Number of new entries and matrices submitted;
- d) Number of modified entries and matrices submitted;
- e) Number of entries submitted with minor changes ;
- f) Number of entries deleted;
- g) Number of entries that were not approved and consequently were not submitted for interregional review;
- h) A table detailing all information from the above items for each NMI (see Appendix 3);
- i) List of contact persons for each submitting NMI and, where applicable, for each service category.
- j) List of SIM reviewers for each service category.

SIM EM CMCs submissions are named according to the following nomenclature:

SIM.EM.N.Year

where,



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N is a consecutive integer for SIM and EM, started with the first submission (not restarted each year).

Year the year when the CMCs are submitted to the JCRB

Both **N** and **Year** are automatically generated by the web page of the JCRB during the submission.

During the interregional review, comments or requests may arrive at the SIM MWG-1 from other regions. Such comments must be forwarded to all the submitting NMIs' CMC coordinators to answer, and perhaps submit an updated CMC file with modifications.

The interregional review is a dynamic process. The NMI CMCs from the SIM submission generally suffer changes due to comments from other RMOs. Each NMI CMC coordinator will have to manage a number of CMC files: those reviewed by each RMO and one which will be created to incorporate all the reviewers' comments, CMCs modifications and NMI responses resulting from the interregional review. In order to make it easy for the RMO reviewer to understand what is going on, it is preferable that the NMI CMC coordinator try answering to the RMO reviewers' comments in the very same CMC file that those reviewers utilized. The NMI CMC coordinator should preferably avoid responding to the RMO reviewers in that file ultimately created to incorporate all comments from the several RMOs and corresponding NMI responses resulting from the full interregional review. Of course, sometimes this will be necessary.

Once the discussions and any modifications have been completed, and the SIM submission reviewed by all RMOs, the NMI CMC coordinators will forward to the SIM WG chair the final version of their CMCs containing the entries approved, all comments from those RMOs involved in the review, responses from the NMIs (reference to dates of emails exchanged may be made if deemed necessary), and final approval from those RMOs. The WG chair will then confirm again with the submitting NMIs that all CMCs from the submitting NMIs are supported by a fully-implemented quality system, reviewed and approved by SIM. The WG chair will then summarize the results in a report and restart the SIM submission for publication in Appendix C of CIPM MRA. This last submission is just for final approval of the SIM CMC set by those RMOs already involved in the review. All interested parties including the SIM TC chair are informed about both the submission and the final publication of the CMC set in the KCDB.

The report issued by the SIM WG chair may include:

1. The date when the SIM CMC set had been initially posted in the JCRB CMC web page;
2. List of NMIs included in the SIM submission;



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3. List of contact persons for each submitting NMI and, where applicable, for each service category;
4. A summary of the reports by each RMO during the interregional review. The summary should have as minimum information the period of time required for the review of SIM submission to be carried out within each region and the final decisions of the RMOs.

8. Review of EM CMCs from other RMOs

Submissions from other RMOs will be forwarded to the reviewers as soon as they are downloaded from the web page of the JCRB by the SIM WG chair. A report issued by the RMO is expected to accompany the RMO submission. It should provide information concerning the RMO's intraregional review and a list of contact persons for each submitting NMI from that region. The RMO report may also provide a list or table of the NMIs submitting new or revised CMC submissions for each EM service category. If this listing is not provided by the submitting RMO, the WG chair will add a report listing all the NMIs involved in that submission and the EM service categories that each NMI has submitted for review. This information will be helpful to the reviewers.

The reviewers (or their deputies in specific cases when the reviewers are unable to report) will examine the RMO submission according to the same CMC acceptance criteria exposed in section 6. Occasionally, if the number of NMIs in the RMO submission is large, the SIM WG chair may request the SIM MWG-1 members to appoint further reviewers.

The reviewers will add three columns, named "Review Status", "Reviewers' Comments" and "NMI Response", all of them headed by an umbrella column named "SIM Review". They will then contact the NMI contact persons listed in the RMO report for any interpretation doubts, inconsistencies with the CIPM MRA requirements that are identified, reports of comparisons that support the CMCs presented (if they are not available in Appendix B of the CIPM MRA <http://kcdb.bipm.org>) and other missing information, or additional actions that should be taken.

Reviewer's questions or interpretation doubts and corresponding answers from the submitting NMI can be exchanged by email. Once a basic understanding of the CMCs has been reached by the reviewer, all the subsequent comments to a given CMC entry should preferably be summarized by filling in the corresponding cell of the "Reviewer's Comments" column. The NMI contact person or the NMI expert responsible for that service category will then respond to the reviewer's comments in the appropriate cell of the "NMI Response" column. Finally, the reviewer will decide on the approval or not of the given CMC entry by assigning a specific code in the corresponding cell of the "Review Status" column (the reviewer should not leave that column blank for all entries reviewed):



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- a) OK – Reviewer’s name – Reviewer’s NMI acronym: The claimed CMC entry is judged to be consistent with relevant information, as indicated above.
- b) NOT APPROVED – Reviewer’s name – Reviewer’s NMI acronym: This code refers to those CMC entries for which the reviewers have raised an objection, but the issue has not yet been resolved.

Based on such discussions, the NMI may modify its CMCs submitted, or withdraw its submission.

The SIM EM CMC review process is expected to be finished within 45 days (except for those cases in which an extension of the deadline is accorded between the SIM WG chair, the reviewer and the RMO TC-EM chair). The deadline accorded will depend on the size of the RMO submission and will of course attend the extreme deadline beyond which SIM will relinquish its right to review. The WG chair will follow up and keep a record of all correspondence and CMCs sent to him.

Once the RMO submission is finally reviewed, the reviewers will forward to the SIM WG chair the final version of the CMCs reviewed containing all their comments and approvals. The WG chair will then summarize the results in a report and upload the reviewed RMO submission in the CMC web site of the JCRB. The process followed for the review of the RMO submission from this point on is described in detail in “Calibration and Measurement Capabilities in the context of the CIPM MRA” (http://www.bipm.org/utils/common/CIPM_MRA/CIPM_MRA-D-04.pdf).

The report issued by the SIM WG chair may include:

- a) Months between which the SIM review of the RMO submission was carried out;
- b) Number of submitting NMIs of the RMO submission;
- c) Number of new entries and matrices submitted;
- d) Number of modified entries and matrices submitted;
- e) Number of entries reviewed;
- f) Number of NMI CMCs reviewed;
- g) Number of reviewed entries that were approved as submitted;
- h) Number of reviewed entries that were approved with modifications;



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- i) Number of entries that needed editorial changes;
- j) Number of entries that were yet not approved;
- k) Number of entries that were not reviewed;
- l) A table detailing the information from items (f) to (k) for each NMI (see Appendix 4);
- m) List of SIM EM CMC reviewers and guest reviewers for each service category;

9. Timelines for SIM Review of EM CMCs from other RMOs

The reader should follow the flowchart in Appendix 2.

- i. Receipt of CMC tables from the originating RMO TC-EM Chair – The SIM WG chair sends the notice of a new CMC review and the file set of modified CMC tables to the SIM NMI CMC coordinators and to the SIM assigned reviewers, along with the summary from the originating RMO. This includes a date when the SIM review needs to be completed, 45 days from the present date.
- ii. Reviewers respond to the SIM WG chair either agreeing to review the CMCs or declining some or all. This should occur within 5 days.
- iii. WG chair assigns new reviewers if necessary, starting with the secondary reviewer if possible.
- iv. Reviewers study the CMC changes (color coded) and determine those which are OK, and which are in question (requiring an exchange of information with the originating NMI). They should make direct contact with the originating NMIs' contact persons and technical experts for any CMCs in question, by e-mail copied to the SIM WG chair and their own NMI CMC coordinator. This first contact message should describe the CMCs in question and the issues concerning those CMCs. This message should be sent within 20 days of receipt of the CMC tables.
- v. The CMC reviewers should request a response within 10 days, and should review the response as soon as possible after it is received. If the issues are not yet resolved they should reply immediately to the NMI contact persons. If possible, all technical issues should be resolved by 35 calendar days after the receipt of the CMC tables. If any issues are not resolved by this time, the reviewers should notify the SIM WG chair, their own NMI CMC coordinator, and the originating NMIs' contact persons, as well as the NMI technical expert. The SIM WG chair should contact the RMO TC-EM chair and explain that if the issues cannot be resolved within 10 additional days the CMC(s) in question will not be approved.



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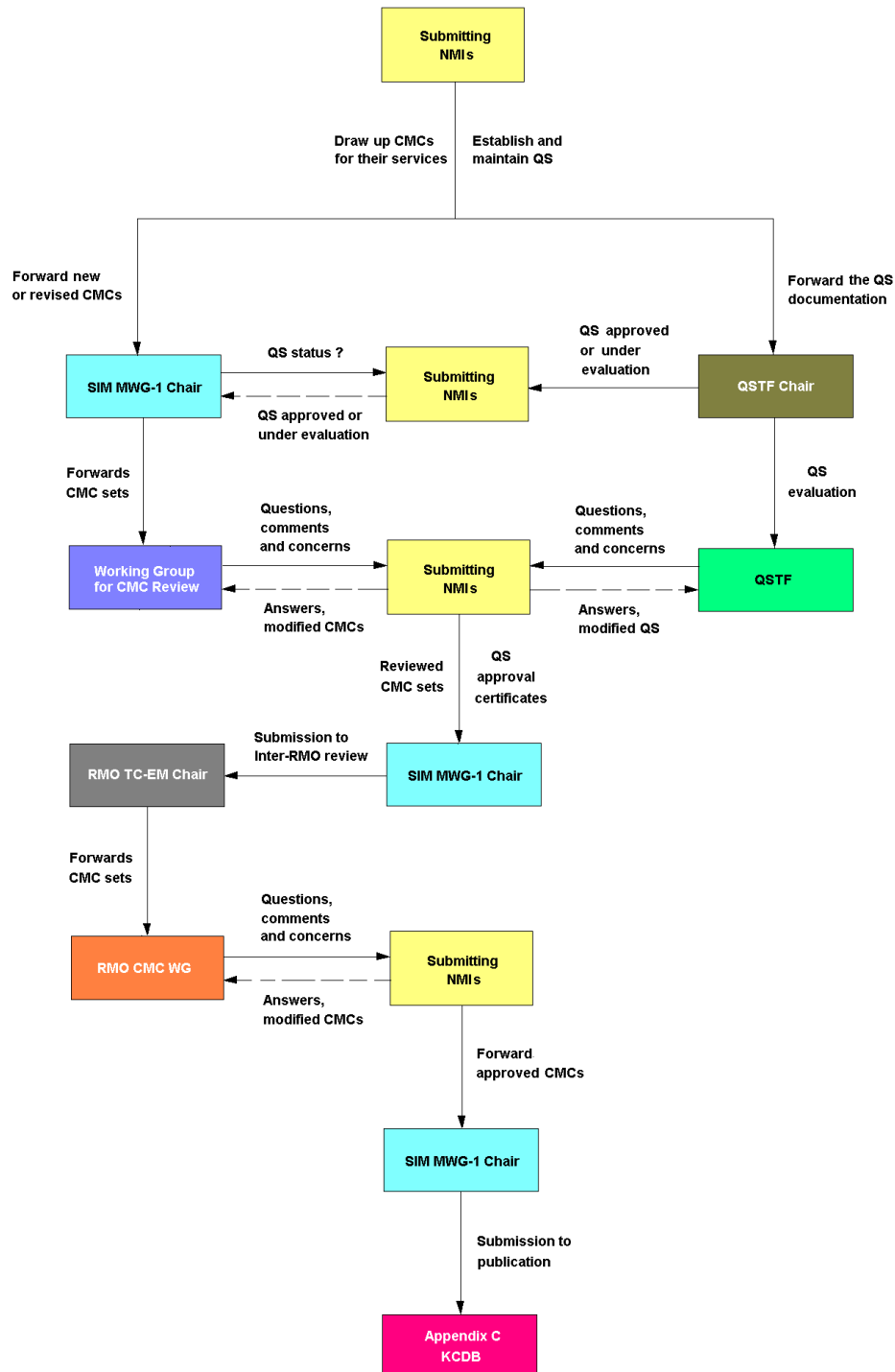
vi. By 45 days after receipt of the CMCs, all reviewers should either approve or not approve all those CMCs that they have agreed to review, and send their completed CMC files to the SIM WG chair. The SIM WG chair should combine the reviews and save them, adding the SIM identifier to the end of the file name of each CMC table. The WG chair should create a SIM RMO report with a summary of the results, and upload this and any other required documents along with the compiled CMC tables to the BIPM KCDB, which will eventually reach the originating RMO TC-EM chair by day 60.



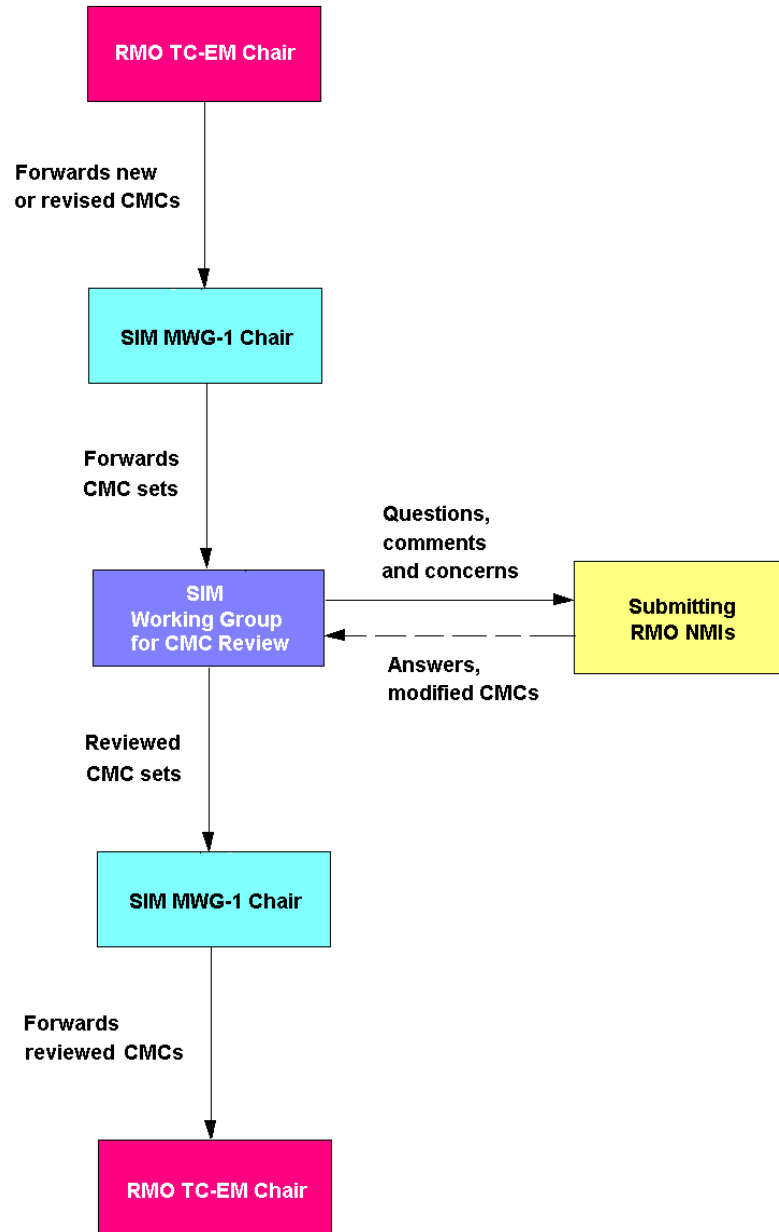
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Appendix 1. Intra-regional review process



Appendix 2. Interregional review process





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Appendix 3. Table of SIM Intra-regional Review (to be included in the SIM report related to the SIM Submission)

SIM.EM.N.Year		Submitted Entries																											
SIM review:		Start	YYYY/MM/DD						End:	YYYY/MM/DD						Version: DD.MM.YY													
No	Country (NMI) Contact	Entries in category	1		2		3		4		5		6		7		8		9		10		11		12		Sum		
			entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	
01	Country 1 (NMI 1) Contact Email	New																					52	47			52	47	
		Modified																										0	0
		Minor changes																										0	0
		Deleted																										0	0
		Not approved																										0	0
02	Country 2 (NMI 2) Contact Email	New	8								1		1														10	0	
		Modified					11																					11	0
		Minor changes			19								1		1													19	2
		Deleted																										0	0
		Not approved																										0	0
Total	New	8	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	52	47	0	0	62	47	
	Modified	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	
	Minor changes	0	0	19	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	19	2	
	Deleted	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Not approved	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Reviewer		Reviewer 1 (NMI)	Reviewer 1 (NMI)	Reviewer 2 (NMI)	Reviewer 2 (NMI)	Reviewer 3 (NMI)	Reviewer 3 (NMI)		Reviewer 4 (NMI)	Reviewer 4 (NMI)	Reviewer 5 (NMI)	Reviewer 5 (NMI)										Reviewer 6 (NMI)	Reviewer 6 (NMI)						



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Appendix 4. Table of SIM Review of EM CMCs from other RMOs (to be included in the SIM report related to the RMO submission)

SIM.EM.N.Year		Submitted Entries																												
SIM review:		Start	YYYY/MM/DD						End:	YYYY/MM/DD						Version: DD.MM.YY														
No	Country (NMI) Contact	Entries in category	1		2		3		4		5		6		7		8		9		10		11		12		Sum			
			entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix	entry	matrix		
01	Country 1 (NMI 1) Contact Email	Approved																					52	47			52	47		
		OK w/ modifications																											0	0
		OK w/ editorial changes																											0	0
		Not approved																											0	0
		Not reviewed																											0	0
02	Country 2 (NMI 2) Contact Email	Approved	8								1		1															10	0	
		OK w/ modifications					11																						11	0
		OK w/ editorial changes			19								1		1														19	2
		Not approved																											0	0
		Not reviewed																											0	0
Total	Approved	8	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	52	47	0	0	62	47		
	OK w/ modifications	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	
	OK w/ editorial changes	0	0	19	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	2	
	Not approved	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Not reviewed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Reviewer		Reviewer 1 (NMI)																												
		Reviewer 1 (NMI)																												
		Reviewer 2 (NMI)																												
		Reviewer 2 (NMI)																												
		Reviewer 3 (NMI)																												
		Reviewer 3 (NMI)																												
	Reviewer 4 (NMI)																													
	Reviewer 4 (NMI)																													
	Reviewer 5 (NMI)																													
	Reviewer 5 (NMI)																													
	Reviewer 6 (NMI)																													
	Reviewer 6 (NMI)																													