

SIM REFERENCE DOCUMENT N° 05

SIM Procedure for Review of Calibration and Measurement Capabilities Submitted for Appendix C of the CIPM MRA

1. Introduction

A Mutual Recognition Arrangement (MRA) entitled “Mutual recognition of national measurement standards and of calibration and measurement certificates issued by national metrology institutes”, drawn up by the CIPM, was signed on 1999-10-14 by the directors of the NMIs of thirty eight Member States of the Meter Convention, and by two international organizations.

The MRA states that *“participating institutes recognize the validity of calibration and measurement certificates issued by other participating institutes for the quantities and ranges specified in Appendix C.”*

“The calibration and measurement capabilities referred to ... are those that are ordinarily available to the customers of an institute through its calibration and measurement services; they are sometimes referred to as best measurement capabilities.”

“A Joint Committee of the RMOs and the BIPM (the Joint Committee or JCRB), created by the CIPM, is responsible for the coordination of data provided by the RMOs, and other actions undertaken by them to promote confidence in calibration and measurement certificates.”

“The Joint Committee is charged with

- a) coordinating the activities among the RMOs in establishing confidence for the recognition of calibration and measurement certificates, according to the terms of the MRA;*
- b) making policy suggestions to the RMOs and to the CIPM on the operation of the MRA;*
- c) analyzing the application by each RMO of the criteria of the MRA;*
- d) analyzing and entering into Appendix C the proposals of each RMO in respect of the calibration and measurement capabilities of their member NMIs and reporting to the CIPM.”*

“The national metrology institutes that are signatories to this arrangement undertake to put in place appropriate structures within their RMOs so that the RMOs may ... participate in the JCRB ... and carry out supplementary comparisons and other actions designed to support mutual confidence in the validity of calibration and measurement certificates issued by participating institutes.”

“For calibration and measurement certificates, the quantities, ranges and calibration and measurement capabilities expressed as an uncertainty are listed for each participating institute in Appendix C. They must be consistent with the results given in Appendix B, derived from the key comparisons.”

* The use of italics indicates a direct quotation from the MRA.

“In addition to participation in the key and supplementary comparisons ... , recognition of calibration and measurement certificates requires one of the following procedures in order to establish the necessary mutual confidence:

a) an NMI that chooses for its calibration and measurement services a quality system that meets the requirements of ISO Guide 25 or equivalent for an NMI, assessed by an accreditation body fulfilling the requirements of ISO Guide 58, declares its calibration and measurement capabilities and submits them to the local RMO for review and transmission to the Joint Committee for analysis and inclusion in Appendix C;

b) an NMI that chooses to use a different way of assuring quality or chooses a different quality system, or ISO Guide 25 without third-party assessment, for its calibration and measurement services declares its calibration and measurement capabilities and submits them to the local RMO for review and transmission to the Joint Committee for analysis and inclusion in Appendix C.

Demonstration of competence and capability may require visits and examination of procedures by an NMI and/or by peers selected by the local RMO.”

Since the signing of the MRA, Guide 25 has been superseded by ISO/IEC 17025 and it is expected that most NMIs will use this new international standard as the basis for their quality systems.

“During the period from October 1999 until such time as the first round of key and supplementary comparisons has been completed and the quality systems put in place, the MRA will operate in a transitional mode. Provisional degrees of equivalence (Appendix B) will be based on the results of comparisons carried out since about 1988, reviewed and approved by the CIPM Consultative Committee for each field. Provisional calibration and measurement capabilities (Appendix C) will be based on corresponding data reviewed by the RMOs and analyzed by the JCRB, taking into account the procedures specified in paragraph 7.3.”

The third meeting of the JCRB, held on 1999-07-15, agreed that a set of provisional data for Appendix C would be prepared as soon as possible. These provisional data will be based on existing results of comparisons and other available knowledge and experience.

2. SIM Review Process

The SIM review process will consist of three parts, a technical review, a quality system review, and a final coordinating review by the Technical Committee (TC).

2.1 Technical Review

The technical basis of the calibration and measurement capability (CMC) submissions from each SIM NMI will be reviewed by the appropriate SIM Metrology Working Group (MWG). All members of the MWG are encouraged to participate in the review process although direct participation in the MRA is limited to SIM 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 SIM as the NMI of an Associate State of the CGPM.

Each NMI should submit its proposed CMCs for Appendix C directly to the appropriate MWG. The MWG will review the submitted CMCs for consistency with relevant information such as:

- a) key and supplementary comparisons listed in Appendix B; and/or
- b) other multilateral or bilateral comparisons; and/or
- c) a history of peer-reviewed measurement activities; and/or
- d) discussions between members of the SIM MWG and the responsible scientists within the NMI; and/or
- e) personal knowledge of MWG members obtained by visits or other means; and/or
- f) performance of currently used equipment, etc.

During the provisional period, the MWG may specify key or supplementary comparisons or additional actions that must be completed before the CMCs can be fully reviewed for consistency with the criteria of the MRA.

Any inconsistencies that are identified or additional actions that should be taken will be discussed with the MWG member representing the submitting NMI. Based on these discussions, the NMI may modify its submitted CMCs, or withdraw its submission. If the NMI decides to submit its CMCs without resolving the inconsistencies or completing recommended actions, this will be noted and the CMCs will continue to be classified as "under review".

Once the discussions and any modifications have been completed, the MWG will transmit the CMCs to the Chair of the SIM TC with a brief report on its review process and recommendations, including notes on any unresolved inconsistencies. The report should indicate the evidence on which the MWG recommendations are based. A copy of the CMCs and the report should also be sent to the SIM representative on the JCRB.

The Chair of the MWG will attempt to obtain unanimity among the MWG members on whether or not each CMC is consistent with relevant evidence and meets the requirements of the MRA. However, if unanimity is not possible, dissenting members may prepare a minority report and submit it to the TC. As with the main MWG report, any minority report should cite relevant evidence.

The review should normally be completed within two months of submission of the CMCs to the MWG.

The RMO review process and completion of key comparisons are expected to be quite lengthy. During this initial transition period of the MRA implementation, it is the intention of SIM to submit all CMCs forwarded by SIM NMIs to JCRB, with a status code indicating the status of the SIM review process. The MWGs are to review all the CMCs submitted and assign one of the following codes for each CMC:

- a) OKAY: The claimed CMC is judged to be consistent with relevant information, as indicated above.
- b) DEFERRED: This refers to a special situation, where no one in the MWG has the technical expertise to assess the claimed CMC. In this case, the critical review is expected to be provided by another RMO, selected by the SIM MWG.

- c) **UNDER REVIEW:** This code refers to all the rest of the cases. These include CMCs that are not yet examined by the MWG, those for which more evidence is needed, and those where the MWG has raised an objection, but the question has not been resolved. Once the review is completed, the CMCs coded **UNDER REVIEW** are expected to be coded in one of the above categories.

2.2 Quality System Review

The TC will affirm its confidence in the quality of the calibration and measurement services of each submitting NMI, taking into account the fact that confidence is typically developed by an established history of peer-reviewed measurement activities, discussions among the scientists responsible for the measurements, exchanges of visits, and a sound administrative and operational framework.

To assist the TC, evidence of quality and competence could be provided by NMIs in the form of an ISO/IEC Guide 25, ISO/IEC 17025 or equivalent system accredited by a body fulfilling the requirements of ISO/IEC Guide 58 or by:

1. A statement by peers from other NMIs that they have examined the procedures and visited the NMI in question and have confidence that the NMI is capable of performing the calibrations/measurements within the uncertainties stated in their calibration and measurement certificates; and
2. A statement from an expert or experts acceptable to SIM that the system to assure quality implemented at the NMI in question meets basic criteria and documents the quality and capabilities of the NMI. These basic criteria include:
 - (i) Technical descriptions of:
 - a) The measurement facility, system, or methods;
 - b) The procedures for conduct of the measurement(s);
 - c) The analysis of uncertainty of the measurement results;
 - d) The procedures for statistical control of the measurement process.

The descriptions must be complete, current, easily accessible, and peer-reviewed, preferably published.

(ii) Competent staff:

- a) The person(s) conducting the measurement must be proficient in performing the required tasks;
- b) The NMI must have on staff, or have regular advisory access to, a nationally or internationally recognized expert in the calibration or measurement area.

(iii) Procedures for dealing with discrepant results:

- a) All complaints regarding the technical content of calibration or measurement certificates must be addressed in an appropriate manner;
- b) Any previously undiscovered error or change in the measurement facility, system, or method; procedures; processes; or controlled parameters that results in changes in currently disseminated calibration or measurement

values must be analyzed, documented, and reported to interested parties, as appropriate.

(iv) Management system and internal audit:

The NMI must periodically conduct a review of its quality system to ensure continuing suitability and effectiveness and to introduce necessary changes or improvements.

Quality systems conforming to ISO/IEC Guide 25 or ISO/IEC 17025 meet these criteria. The SIM review process will take this into account but must insure that the accreditation process was appropriate for an NMI and that the technical assessors were recognized experts in the calibration or measurement area.

2.3 Coordinating Review

The TC will review the recommendations of the MWGs to insure reasonable uniformity between them.

The TC will discuss any inconsistencies that have been noted by the MWGs and any minority reports prepared by dissenting members and will attempt to resolve them in discussions with the NMI in question. Unresolved issues may be passed back to the MWG with comments by the TC or may be forwarded to the JCRB as a note attached to the CMC in question.

If an MWG has not been able to come to a conclusion on a particular CMC, the TC will attempt to find other reviewers, not necessarily from within SIM, who have the expertise to analyze the supporting evidence provided by the NMI.

The TC review should normally be completed within six weeks of receipt of a recommendation from a MWG. The proposed CMCs will then be forwarded to the JCRB together with any notes of inconsistencies or other unresolved issues.

In accordance with the Rules of Procedure of the JCRB (agreed at the 2nd meeting, February 1999), proposed CMCs must be sent to the JCRB 4 months before the meeting at which they are to be discussed.

3. CMCs From Other RMOs

Other RMOs have procedures for reviewing and analyzing their CMCs and for proposing them to the JCRB. Documentation describing these procedures will be available to all members of the JCRB, including SIM, so that each RMO can have confidence in the results of the procedures of the others.

Each RMO will have the opportunity to comment on the CMC submissions from other RMOs according to the following timetable, taken from the report entitled "Brief Report of the Decisions and Conclusions of the Second Meeting of the JCRB held at the BIPM on 15th and 16th February 1999":

- "a) the NMI sends its draft CMC to the local RMO and undertakes whatever discussion and action are necessary for it to be approved;

- b) the local RMO sends the approved CMC to the JCRB secretariat 4 months before the next meeting of the JCRB;
- c) the CMCs from RMOs are immediately sent to the nominated representatives of all RMO members of the JCRB;
- d) each RMO examines the proposed CMCs and sends a draft opinion to the JCRB secretariat at least six weeks before the meeting of the JCRB. These draft opinions are distributed to representatives of RMOs at least one month before the meeting;
- e) The JCRB meets to examine the proposed CMCs;
- f) One month after the meeting of the JCRB and provided that there are no objections registered by RMOs, the JCRB secretariat enters the CMCs into Appendix C and the key comparison data base.”

The JCRB at its 4th meeting on 20 and 21 March 2000 was of the unanimous opinion that the declared objectives of the MRA require that CMC data entered in Appendix C must be declared fully reliable by the RMOs. In consequence, CMC files submitted by NMIs will remain in the review and analysis loops of the RMOs and the JCRB until such time as this is the case.

In reference to step (d), the submissions from other RMOs will be sent to the appropriate SIM MWG Chairs. Each MWG may review and provide comments. If comments are to be submitted, the MWG Chair must send them to the Chair of the SIM TC (with a copy to the SIM representative on the JCRB) at least nine weeks before the next JCRB meeting so that they can be reviewed by the TC and forwarded to the JCRB according to the above timetable.

This review process is summarized in the following table.

4. Abbreviations

The following abbreviations are used in this document:

BIPM	Bureau International des Poids et Mesures
CIPM	Comité International des Poids et Mesures
CMC	Calibration and Measurement Capability
DMR	Declaration of Measurement Recognition
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
JCRB	Joint Committee of RMOs and the BIPM
MRA	Mutual Recognition Arrangement
MWG	Metrology Working Group
NMI	National Metrology Institute
RMO	Regional Metrology Organization
SIM	Sistema Interamericano de Metrología
TC	Technical Committee