

# EURAMET Guide on Comparisons

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## **Purpose**

This document describes EURAMET specific aspects in planning, initiating and conducting inter-laboratory comparisons, with the purpose to give guidance on carrying out comparisons within EURAMET and to harmonise criteria among different Technical Committee (TC), as far as reasonable.

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## 1 INTRODUCTION: SCOPE OF THE GUIDE

This document describes EURAMET specific aspects in planning, initiating and conducting inter-laboratory comparisons, with the purpose to give guidance on carrying out comparisons within EURAMET and to harmonise criteria among different Technical Committee (TC), as far as reasonable.

It should always be used in combination with CIPM MRA-D-05 “Measurement comparisons in the CIPM MRA” [1] and with guiding documents of the relevant Consultative Committee of the Metre Convention (CC), in case such a guide is existing. Specific TC-internal guidance documents might also be available.

The rules given in CIPM MRA-D-05 “Measurement comparisons in the CIPM MRA” [1] are applicable to all Key and Supplementary Comparisons (KC/SC) carried out in EURAMET. It is considered as master document. They should also be applied to Pilot Studies (PS), in principle. However, some specific clauses might not be applicable in the same stringent form.

Some Consultative Committees (CC) have prepared specific guidelines for comparisons in their field. In case that these guidelines are in conflict with the rules of this EURAMET guide, the issues shall be discussed on a case by case basis with EURAMET BoD and TCCs.

This EURAMET guide is describing EURAMET-specific aspects. It is not intended to duplicate the content of [1]. Generally, just reference to [1] is given, when applicable. Only for matters of readability and coherence of the text, some information given already in [1] is repeated in this guide. Please note that detailed descriptions made in this guide on KCs are referring to EURAMET-KCs only, and not to CC-KCs, even if this is not explicitly mentioned.

## 2 TYPES OF COMPARISONS

### 2.1 Categories of Comparisons and their purpose

CIPM MRA-D-05 [1] describes three categories of measurement comparisons within the CIPM MRA:

- 1) Key comparisons (KC)
- 2) Supplementary comparisons (SC)
- 3) Pilot studies (PS)

Comparisons can be carried out

- a) at an international level, organised by a CC or by the BIPM <sup>1</sup>
- b) at a regional level, organised by a Technical Committee of an RMO

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<sup>1</sup> International key comparisons according to [1] are called CIPM-KC. In this guide reference is made to CC-KCs only. Therefore, this term shall be used, rather than CIPM-KC.

Key comparisons (KC) are selected by a Consultative Committee (CC) to test the principal techniques and methods in the field [1]. A KC carried out by a CC results in a key comparison reference value (KCRV) [1]. A KC can also be carried out by an RMO; it must follow the same protocol as a preceding CC-KC and will provide the linkage to the respective KCRV for the participants from the RMO. It must be approved in advance as KC by the corresponding CC or CC Working Group. An RMO-KC may be launched while the corresponding CC-KC is still running.

For KCs, subsequent bilateral comparisons may be organised with the pilot laboratory or one of the participants. Such bilateral comparisons may be requested by an institute that considers its result in the KC as unrepresentative of its standards or if the participation of the institute at the time of the KC was not possible. Such bilateral comparisons should take place as soon as possible after the completion of the corresponding KC. The subsequent bilateral comparison is considered as a new and distinct comparison.

Bilateral comparisons cause an extra effort in organisation and linking them to the results of a KC. If possible, a laboratory should try to avoid a bilateral comparison, whenever it has the possibility to join a KC or SC within a reasonable time. Also the possibility to join a KC or SC of another RMO should be considered.

Supplementary comparisons (SC) are comparisons, usually carried out by an RMO to meet specific needs not covered by a KC, for instance measurement of specific artefacts, quantities, or measurements of parameters not within the “normal” scope of the CC ([1] sec. 2.2). In particular, they may include laboratories which would not fulfil the requirements for participation in a KC.

Pilot studies (PS) are a third category of comparisons introduced in [1]. They are normally undertaken to establish confidence in measurement for a “new” field or instrument, or as a training exercise ([1] sec. 2.3).

The term pilot study shall be used in EURAMET for all type of comparisons not being KCs or SCs.

Specific purposes of a pilot study may be:

- Testing of new instruments
- Testing of new methods or methods at an early stage
- Preparation of a KC
- Training for emerging NMIs
- Benchmarking of an NMI, in particular if it has never participated in a KC or SC before
- New metrology fields or quantities, where no CMCs are to be supported now or in near future.

While the results of KCs and SCs are directly used to support CMC claims of the participating NMIs ([3] sec. 3), the results of PS alone are normally not considered as

sufficient evidence ([1] sec. 2.3). They may, however, be used as additional information for supporting CMC claims, if the measurement results have been treated confidentially during the comparison.

More information can be found in [1] sec. 2.

An overview on types of comparisons is given in the table below:

Type	Level	Objective(s)
Key Comparison (KC)	CC	- Generate KCRV - Support CMC claims
	RMO	- Link to a KCRV - Support CMC claims
Supplementary Comparison (SC)	RMO	- Meet specific needs not covered by a KC - Support CMC claims
Pilot Study(PS)	CC RMO	- Testing new methods or instruments - Training / benchmarking for NMIs - May be used as additional information for supporting CMC claims

## 2.2 Eligibility for participation in comparisons

Participation in CC-comparisons is decided by the CIPM MRA rules. In general, participation is restricted to NMIs and DIs from countries being signatories to the CIPM MRA. Exceptions are possible.

Participation in EURAMET comparisons is open, in principle, to all members of EURAMET, National Metrology Institutes (NMIs) or associated Designated Institutes (DIs), provided the technical competence of the institute is appropriate for the particular comparison.

In the case of EURAMET KCs and SCs, the participation should, in general, be restricted to NMIs and DIs, in line with CIPM rules. For EURAMET pilot studies more flexibility is given.

With the consent of all participating members of EURAMET also NMIs or DIs from other RMOs as well as Liaison Organisations of EURAMET (Corresponding NMIs) can be invited to participate. In exceptional circumstances and in particular for PS, participation of expert guest laboratories may be appropriate. Its participation should not be in conflict of interest of the national representative (NMI or DI) in the TC. For details see [5].

For more information, consult [1] sections 5.1. and 7.1.

### 3 ROLES AND RESPONSIBILITIES

In the preparation of comparisons, roles and responsibilities should be assigned in a way, that an effective implementation of the comparison is ensured, and that workload is shared among participants in a fair and the best possible way.

#### 3.1 Technical Committees, Sub-Committees, TC-Chair

The Technical Committees (TCs) have the responsibility for identifying the needs for comparisons by consultation of the EURAMET members and by other means. They shall discuss relevance, priorities and modalities of the proposed comparisons and decide on those to be carried out and on their time schedule.

In many TCs, the specific needs for comparisons and their modalities are discussed by the concerned Sub-Committees. The Sub-Committees should bring forward their proposals to the plenary meeting for endorsement.

The TC-Chair has the responsibility to coordinate or oversee the whole process and to ensure that the comparison is in line with EURAMET policies and properly agreed with the TC. In particular, the TC-Chair should

- receive proposals for new comparisons and initiate the required consultation process,
- bring proposals for comparisons on the agenda of the TC meeting,
- decide if in exceptional cases a proposal for a new comparison might be discussed and decided upon in between annual meetings of the TC via correspondence (the TC-Chair might take the decision after consultation of the TC contact persons),
- register the comparison in the EURAMET TC project database and in the KCDB,
- request the regular reporting from the pilot laboratory on the progress of the comparison,
- report to the BoD regularly on the progress of the comparisons, and in particular whenever specific issues with a comparison are identified,
- do the required steps for the approval of the report, as described in sections 6.2 and 6.4,
- submit the final report to EURAMET or the relevant CC,
- submit the report to the KCDB office for publishing in the KCDB.

The TC-Chair might delegate part of these responsibilities to a Sub-Committee Convener or another TC contact person, ensuring, however, their proper conductance. Registration of a comparison and submission of reports to a CC or a CC working group should in any case be done by the TC-Chair.

### 3.2 Pilot laboratory

When agreeing on a comparison, one of the participants must be assigned the role of the coordinator, in this guide called pilot laboratory <sup>2</sup>.

The pilot laboratory has the principal responsibility for

- specifying the group of participants,
- drafting the technical protocol in consultation with the participants and the TC-Chair,
- preparing the registration of the comparison in the EURAMET TC database and in the KCDB (if applies), by filling the templates, and provide the filled templates to the TC-Chair,
- organising the preparation of the transfer standard(s) and its/their circulation among the participants,
- collating the measurement results of the participants,
- giving follow-up at all stages and reminding delayed participants on their outstanding duties,
- consulting the TC-Chair in case of major issues like significant delays, damage or loss of a standard, etc.,
- preparing annual progress reports for the TC-meetings and the TC project database,
- evaluation of the comparison,
- linkage of the results to the KCRV (in case of a KC),
- preparing the report.

### 3.3 Link laboratories

In case of a EURAMET KC, at least two of the participants, where possible, should have participated in the preceding CC KC, in order to allow a proper linkage of the comparison results to the KCRV (see [1] sec. 5.1). CC recommendations might differ from this general rule in specific fields or sub-fields and should then be taken as reference.

All EURAMET participants of the previous or current CC KC of the quantity have an obligation to serve as a link laboratory in the EURAMET KC, if requested.

The pilot laboratory does not necessarily need to be a link laboratory.

### 3.4 Support group

In order to release the pilot laboratory from workload, in particular in the case of comparisons with a high number of participants, one or several participants may support

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<sup>2</sup> In other documents the terms “coordinating laboratory” or “pilot institute” [1] are used.

the pilot laboratory. An appropriate sharing of responsibilities in line with the specific interest and capabilities should be agreed.

A specific purpose of the support group might be to prepare less experienced laboratories to the task for coordinating future comparisons.

### **3.5 Participants**

Before agreeing to participate in a EURAMET comparison, the laboratory must make sure that

- it has the technical competence to handle the transfer standard and to do the measurements as described in the protocol,
- it has the capacity to carry out the measurements within the foreseen time schedule,
- resources are available for a proper transport of the transfer standard to the next laboratory.

A laboratory is expected to participate in a EURAMET KC (or alternatively in the corresponding CC KC), in case it has published CMCs related to this KC.

The participating laboratory must accept that their results are published in the final report of the comparison, even if they are not satisfactory for the laboratory.

The participants confirm that they accept these conditions by signing the EURAMET template [10].

### **3.6 EURAMET Secretariat**

The EURAMET secretariat is maintaining and updating EURAMET project database. The secretariat should

- review the list of participants with respect to eligibility criteria and consult the TC-Chair in case that laboratories not being NMI or DI are suggested to participate,
- register the comparison in the EURAMET TC-project database,
- maintain the database with updated text, documents and links,
- ask for annual update of ongoing projects.

## **4 INITIATION OF A COMPARISON**

The organisation of a EURAMET comparison is performed in a similar way as described in [1] section 4. It can be helpful to draw up a flow chart for the comparison process.

### **4.1 Proposing a comparison, discussion and agreement in the TC**

A EURAMET comparison may be proposed by any contact person of a Technical Committee (TC) or Sub-Committee. The proposal shall be sent to the TC-Chair, who will inform all TC contact persons and will initiate further steps. The TC may have an internal practice to delegate this responsibility to concerned Sub-Committee Conveners.

As guidance for identifying the needs for comparisons in EURAMET, the list of KCs identified by the relevant CIPM Consultative Committee (CC) and the periodicity of the comparisons as set by the CC should be used. Proposals in particular for SC and PS may be brought into the TC from the BoD Working Group for Capacity Building (BOD-WGCB), in particular presenting the specific needs of emerging EURAMET members for comparisons. Other procedures for identifying needs may be used.

It is recommended to propose the new comparisons in advance to the meeting of the TC, as this will enable the contact persons to consult the management of their institute prior to this meeting. Such consultation is important to reach agreement about the involvement of the institute in the comparison and, if so, to guarantee that the required resources and time needed to undertake the work will be made available.

At their annual meetings, the TCs shall discuss and examine the actual needs for comparisons and priorities.

The decision on the comparisons as such and on their modalities is taken by the TC, normally at its plenary meeting. In exceptional cases and in particular for pilot studies, it might also be discussed and decided in between annual meetings by correspondence. It is the responsibility of the TC-Chair to guide this process, to ensure that all interested laboratories or potential participants are informed properly and to take the respective decisions, if needed after consultation of the TC contact persons.

After each meeting of the TC, the TC-Chair informs the Secretariat of EURAMET about decisions taken on the EURAMET comparisons that are going to be organised.

By a long-term planning and appropriate comparison schedules, the TC ensures that the workload for the whole set of comparisons is not too big for the participating and pilot institutes, and that the comparisons can be concluded within a reasonable time. Three years should not be exceeded.

Bilateral comparisons may be proposed by the laboratory which requires linkage to a KC. The TC-Chair can initiate the comparison after informing the TC accordingly. The TC should have the opportunity to oppose to the bilateral comparison for good reasons. In general, the possibility to open the comparison to further laboratories with the same need should be considered, having in mind that bilateral comparisons are usually causing extra

effort and complications in linking to KCs. The alternative to join a KC in another RMOs should also be considered.

#### **4.2 Agreement on participants**

In principal, participation in a EURAMET comparison is open to all member NMIs of EURAMET and associated DIs, provided the technical competence of the institute is appropriate for the particular comparison.

In some comparisons the number of participants can be limited for technical or logistics reasons. If this is the case, it should be envisaged to repeat the comparison as soon as possible to give all interested members the opportunity to participate within a reasonable timeframe.

Participation of laboratories further to EURAMET NMIs or DIs is possible, following the eligibility criteria described in section 2.2. In particular, the TC should be open to the participation of NMIs or DIs from other RMOs in the frame of the CIPM MRA, if this is not strongly affecting the conductance of the comparison.

If a member of EURAMET or an external laboratory expresses interest in participating in a comparison that has already started the pilot laboratory must consider what effect the participation may have on the time schedule. The a priori assumption should be that the additional participation should not extend considerably the duration of the comparison. If all the participants agree then the entry can be accepted.

Otherwise it is left to the pilot laboratory or another participant to enter in a bilateral comparison with this laboratory once the comparison is completed.

#### **4.3 Technical protocol and preparation of the comparison**

The pilot laboratory is drafting the technical protocol in consultation with the participants and the TC-Chair, and supported by the support group.

The technical protocol has to be drawn up in line with [1] sections 4.3 and 4.4. It must have at least the following information (when applicable):

- a) Introduction on the subject and exact definition of the measurand(s) of the comparison
- b) Description of the scheme/topology <sup>3</sup> of the comparison
- c) Stability check of the transfer standard, i.e. via measuring the standard at least in the beginning and the end by the same laboratory
- d) Time schedule, in particular starting date and envisaged date of conclusion

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<sup>3</sup> A comparison may range from the simple circulation of a single travelling standard around all the participants to the sending of an individual travelling standard directly to each participant from the pilot institute, or from each participant to the pilot institute or some combination of these ([1] sec. 4.3)

- e) Description of the transfer standard(s): make, type, serial number, technical data needed for operation, stability statement, etc.
- f) Advice on handling and organising the transport of the transfer standard
- g) Test to be carried out before measurements
- h) Handling of the transfer standard(s) at receipt and during measurements
- i) Description of the used calibration method, measurement conditions and calibration points
- j) Presentation of the results
- k) List of the principal components of the uncertainty budget
- l) Timetable for communicating the results
- m) Principle of evaluation of the results and linkage mechanism to the corresponding KCRV
- n) Financial aspects, e.g. transportation or costs for transfer standard if applicable
- o) Reference to useful documents

Furthermore, possible customs issues should be discussed before starting a comparison and custom documents to accompany the traveling standard should be described in the protocol, if applicable.

A EURAMET key comparison must basically follow the same protocol as a preceding CC key comparison. A restricted scope for individual participants is admissible, if the participant is not able to deliver all measurement points of the protocol.

The circulation time of transfer standards or transfer instruments must be fixed and may exceed eighteen months only in exceptional circumstances. Options to cope with a large group of participants in case of round-robin comparisons should be analysed, for example organising two or multiple parallel loops with linking laboratories measuring the transfer standards of both loops.

In case of key and supplementary comparisons to be registered in the KCDB, the pilot laboratory shall send the draft protocol via the TC-Chair to the appropriate CC working group for approval (in case of KC) or information (in case of SC). The KC must be compatible and linkable to the parent CC comparison.

As a next step, the pilot laboratory sends a formal invitation to all members of the TC and concerned Sub-Committees and the envisaged external participants, with a deadline for confirmation of the participation, using the template [10]. Having received the confirmations from the participating laboratories, the pilot laboratory draws up the final circulation scheme for the transfer standards and the time schedule.

#### **4.4 Registration in the EURAMET project database**

Each EURAMET comparison shall be registered in the TC project database on the EURAMET website.

In the case of mixed comparisons with participants from other RMOs, it shall be registered in case that EURAMET is the coordinating RMO, i.e. the initiative comes from EURAMET with external participants being invited by EURAMET and the comparison being under control of a EURAMET TC. The comparison shall serve in first instance the interest of EURAMET members to demonstrate their technical capabilities.

Examples for comparisons which should not be registered in the TC-project database are.

- One or several EURAMET laboratories are participating in a comparison organized by another RMO. This comparison should be registered by the other RMO.
- Comparisons, in particular pilot studies, where a EURAMET NMI is providing technical assistance or knowledge transfer to NMIs beyond EURAMET.

Once the comparison is agreed by the TC and, in the case of KCs and SCs, confirmed by the corresponding CC working group, the TC-Chair is registering the comparison on the TC project database, by sending the filled template [7] to the EURAMET Secretariat. The pilot laboratory shall support the TC-Chair by filling the template.

#### **4.5 Registration in the KCDB**

Once the appropriate CC working group has approved the technical protocol of a EURAMET KC or SC, the pilot laboratory shall fill the appropriate BIPM form [6] for registering the comparison in the KCDB. The TC-Chair shall register the comparison. Once it is registered, the pilot laboratory shall provide the registration number to the Secretariat for entering it into the TC project database.

The nomenclature for KCs and SCs registered in the KCDB is described in [1] sec. 3.1.

The TC shall discuss, whether the comparison shall have the format of a KC or SC, and consequently be registered in the KCDB, or the format of a pilot study (PS). In general, each comparison which has the principal purpose to support CMC claims of the participating laboratories, should be proposed as SC or KC and registered in the KCDB.

EURAMET PS for the cases described in Section 2.1 are not registered in the KCDB. Nevertheless, also the results of a PS can be used as additional, but not exclusive, information to support CMC claims. Once a comparison has started as PS, it cannot be "upgraded" to a KC or SC.

## **5 CONDUCTING A COMPARISON**

### **5.1 Performing the measurements**

The pilot laboratory has to organise the transport of the transfer standards or transfer instruments and has to ensure that the participants make proper arrangements for local customs formalities. This includes also handling instructions for the equipment at the customs office.

For circulating the transfer standard, there are several options, for example:

- a) Every participant organises the transport to the next participant on his own responsibility and costs.
- b) A company is hired to organise the circulation centrally. A corresponding fee should be paid by the participants to cover the costs. Hence, in this way administrative complications are avoided for the participants.

The measurements must be performed by the participants of the comparisons strictly following the technical protocol. If for some technical reasons, an institute cannot perform the measurements according to this protocol and still wishes to participate, proper consultation with the pilot laboratory must take place before measurements are made.

If after the start of the comparison, a participant is unavailable to perform the measurements in its allocated time slot, the pilot laboratory will try to re-arrange the schedule with the agreement of the concerned participants, trying to not extend excessively the comparison. If this is not possible, it is left to the pilot laboratory or another participant to organise a bilateral comparison after the EURAMET comparison is completed.

The participating laboratories must submit the results of a comparison to the pilot laboratory as soon as possible and at the latest six weeks after the measurements are completed. See for more details [1] sec. 4.6. A laboratory may be excluded from the comparison if the 6 weeks' deadline for reporting the results is not kept.

For complete transparency, the pilot laboratory may consider submitting their results to some independent party, e.g. the Secretariat, ahead of receiving results from other participants.

### **5.2 Monitoring the progress**

Each participating laboratory shall inform the pilot laboratory immediately when the transfer standard is received, and when the transfer standard is sent to the next participant. Whenever an issue occurs, like arrival of the standard in an inappropriate form or inability to carry out the measurements within the time schedule, the pilot laboratory must be informed immediately.

The status of the comparison (who has measured already, location of the artefact, etc.) should be known to the pilot laboratory at any moment. The pilot laboratory shall inform the TC-Chair accordingly.

The progress of the comparison is reported at the annual TC-meeting using the template for the TC-project progress report [8]. After the TC-meeting, the TC-Chair shall forward the project report to the EURAMET Secretariat for upload to the TC project database.

### **5.3 Dealing with delays and other issues**

The overall objective is that a EURAMET comparison should not take more than 3 years from start of the measurements to Draft B report being available. In justified cases, in particular when unexpected problems occur after the start of the comparison, the period can be expanded with approval of the BoD.

The general practice when a delaying laboratory does not respond to reminders is to enter into the following “escalation chain”:

- Pilot laboratory informs TC-Chair
- TC-Chair informs/consults TC contact persons
- TC-Chair informs Secretariat; Secretariat gives follow-up, informing as a first step EURAMET Chairperson and BoD
- EURAMET Chair or BoD or Secretariat informs/consults delegate of the delayed laboratory and, in case of a DI, the DI-representative
- Exclusion of the laboratory from the comparison: BoD decides, following a proposal from the TC-Chair

As guidance, the following corrective measures should be taken:

<b>Issue</b>	<b>Corrective measures</b>
Measurements are not performed properly, but issue is reported by the laboratory	<ul style="list-style-type: none"> <li>- Laboratory gets the opportunity to repeat measurements at the end of the loop, if feasible and if all other participants agree.</li> <li>- Exclusion of the laboratory from the comparison, if issue cannot be resolved.</li> </ul>
Measurements are not performed within time schedule / transfer standard is not sent to the next participant	<ul style="list-style-type: none"> <li>- Pilot lab sends reminder.</li> <li>- If laboratory is not responding, it will be excluded from the comparison after a final alert to laboratory and Delegate.</li> </ul>
Transfer standard is damaged or shows stability issues	<ul style="list-style-type: none"> <li>- Replacement and linkage to original standard, if possible.</li> <li>- Replacement of standard and repetition of all measurements.</li> </ul>
Measurement results are not sent to the pilot lab within deadline	<ul style="list-style-type: none"> <li>- Pilot laboratory sends reminder.</li> <li>- If laboratory is not responding, it will be excluded from the comparison after a final alert to laboratory and Delegate.</li> </ul>
Pilot lab is delayed in preparing the report	<ul style="list-style-type: none"> <li>- Support group offers support to pilot laboratory.</li> <li>- TC-Chair consults TC if a further participant can support.</li> <li>- TC-Chair suggests, after consultation of the participants, to pass the responsibility for preparing the report to another participant.</li> </ul>

## 6 REPORTING

The principal scheme of reporting via Draft A, Draft B and Final Report is described in [1] Section 4.7. Specific information on RMO KCs and SC is given in [1] section 5.3 and 7.2.

### 6.1 Preparing Draft A report of a EURAMET comparison

After all participants have sent the results, the pilot laboratory has 2 months for preparing Draft A report <sup>4</sup>.

The report of key and supplementary comparisons must include at least (when applicable):

- a) Introduction on the subject and exact definition of the measurand(s) of the comparison
- b) Description of scheme/topology of the comparison
- c) Participants
- d) Description of the transfer standard and the handling of the equipment
- e) Description of the used calibration method and calibration points
- f) Measurement conditions and equipment of each participant
- g) The stability determination of the transfer standard and required corrections (if applicable)
- h) The participants' results
- i) Calculation of a reference value of the comparison (in case of a SC) or description of the linkage to a KCRV (in case of a KC)
- j) The degree of equivalence (DoE) with the reference value of each participant
- k) Uncertainty budget of each participant
- l) Conclusions
- m) Appropriate analysis to verify if uncertainty claims correspond to those of published CMCs <sup>5</sup>
- n) References

In the case of EURAMET KCs no reference value is determined. DoE are calculated by an appropriate method of linking to the KCRV of the CC-KC.

In case of a SC, DoE relative to the SC reference value may be computed, but this is not mandatory.

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<sup>4</sup> In some CCs a "pre-draft A" is prepared in a first step.

<sup>5</sup> This CMC monitoring process may be done in an alternative way beyond the protocol of the comparison. If this is the case, it should be mentioned in the report

Reference values of a comparison must be determined by appropriate statistical methods, as for example the ones described in [9], or methods described in corresponding CC-guidelines.

If, at the moment when a EURAMET KC is finalised, the KCRVs are not yet available, the stated reference values of this comparison must be made available for third parties via the official report published in "Metrologia". In such cases, it must be mentioned in the report that the stated reference values are not KCRVs.

When Draft A is submitted to the participants, the pilot laboratory must also give a proposal, in accordance with [1] sec. 4.7, in which form the results of the comparison should be published.

Participants have two months to comment on the Draft A report. The Draft A report, once approved by the participants, is considered as Draft B report.

## **6.2 Draft B and Final report of a EURAMET comparison**

In the case of a pilot study (PS), the accepted Draft B becomes the final report and is sent by the TC-Chair to the Secretariat for publication in the TC project database.

In the case of a KC, the accepted Draft B report is sent by the TC-Chair to the Executive Secretary of the relevant CC and to the Chair of the appropriate CC key comparison working group with the request for approval by the CC. Normally the CC decides on the approval within six months after the submission of the report.

In the case of a SC the accepted Draft B report is sent by the TC-Chair to the Executive Secretary of the relevant CC and to the Chair of the appropriate CC key comparison working group to allow for a six-week period of comment and editorial control ([1] sec. 7.2).

Exceptions from this approval procedure of the draft B report of a SC are possible, in line with [1], sec. 7.2: "Those CCs that wish to discuss RMO SC reports and approve them at the meetings of their relevant CC working groups may do so."

At this stage, the results are not considered as confidential anymore and can be used to support CMC claims ([1] sec. 4.7).

Once Draft B is approved by the CC, it is considered as the final report. The pilot laboratory informs the TC-Chair; the TC-Chair sends the final report to the participants of the comparison, to all Contact Persons and to the Secretariat for publication in the TC project database.

## **6.3 Dealing with results inconsistent with published CMCs**

The first and principal responsibility to identify that the results of a comparison are inconsistent with published CMCs is within the participating NMI.

The participants should give a written statement indicating if their results are consistent with the CMC claims or not. If not, corrective actions should be described. Depending on this statement the TC should decide if the “greying out” of CMC should be asked for.

The TC-Chair should take next steps, in particular inform the TC-Q about inconsistent results. The TC-Q decides if CMCs should be suspended or greyed-out until corrective actions are applied and takes the respective measures.

#### **6.4 Entry into the KCDB**

The results of KCs and SCs are published in the KCDB.

The TC-Chair sends the final report to the Executive Secretary of the relevant CC and to the KCDB office, together with a clear statement, that the report is approved by EURAMET and/or the CC ([1] sec. 8).

#### **6.5 Good practice for evaluating comparisons and preparing reports**

In order to facilitate the evaluation of comparisons and the preparation and review of their reports, it is recommended that the TCs establish permanent expert groups and a set of tools and templates.

## APPENDIX A: References

- [1] CIPM MRA-D-05: *Measurement comparisons in the CIPM MRA*
- [2] *CIPM MRA – Technical supplement to the arrangement*
- [3] CIPM MRA-D-04: *Calibration and Measurement Capabilities in the context of the CIPM MRA*
- [4] EURAMET Guide 3: *EURAMET procedures and review criteria for CMCs*
- [5] G-GNP-POL-006: *Eligibility criteria for participation in EURAMET TC projects*
- [6] *Key and supplementary comparisons (and pilot studies) - registration and progress form*  
<http://www.bipm.org/en/cipm-mra/cipm-mra-documents/>
- [7] G-OPS-TMP-024: *EURAMET Project Form*
- [8] G-OPS-TMP-025: *EURAMET Project Report*
- [9] M.G. Cox, *The evaluation of key comparison data*, Metrologia, 2002, Vol. 39, 589-595.
- [10] G-OPS-TMP-035 Participation in EURAMET Comparison: Participation form to be signed by participants

## **APPENDIX B: Glosarry**

BoD	EURAMET Board of Directors
CC	Consultative Committee of the Metre Convention
CC-KC	Key comparison organised by a Consultative Committee
CIPM	International Committee for Weights and Measures of the Metre Convention
DI	Designated Institute
DoE	Degree of Equivalence
KC	Key Comparison
KCDB	Key Comparison Data Base
KCRV	Key Comparison Reference Value
MRA	Mutual Recognition Agreement
NMI	National Metrology Institute
PS	Pilot Study
RMO	Regional Metrology Organisation
SC	Supplementary Comparisons
TC	Technical Committee



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