

## **CCT Guidelines for comparisons**

The Consultative Committee for Thermometry (CCT) has delegated the coordination of comparisons to its Working Group for Key Comparisons.

The terms of reference of the Working Group for Key Comparisons (WG-KC) are

- to oversee all aspects of key comparison documentation, starting with the protocol and ending with the Draft B Report and the KCDB entry, including provision of advice to pilots on the calculation of degrees of equivalence, key comparison reference values and linkage between RMO and CIPM key comparisons.

The tasks the WG-KC are

- examining all relevant document for each key comparison starting with the protocol and ending with the Draft B Report;
- advising the pilot laboratory in preparing the text of the entry to Appendix B of the CIPM MRA as required<sup>1</sup>, and to approve the Draft B Report on behalf of the CCT for inclusion into the BIPM key comparison database (KCDB);
- advising the pilot laboratory about the preparation of a comparison status document;
- review and comment on supplementary comparison Draft B reports.

The WG-KC is also available to review technical protocols for supplementary comparisons on request.

Comparisons are the most direct support for institutes claiming Calibration and Measurement Capabilities. It is therefore essential that the comparison rely on a solid technical protocol, and that the final report leads to results that cannot be disputed.

For this reason, but also with the aim to simplify and harmonize comparison outcomes, and make sure that all the necessary information is included in the technical protocol and final report, the WG-KG has developed a template for technical protocol and final report at are listed below.

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<sup>1</sup> All key and supplementary comparison should be registered by the comparison pilot in the KCDB via the KCDB web platform <https://www.bipm.org/kcdb/> as “Planned”, before starting.

## Template for Technical Protocol

**"Acronym (CCT-KX, RMO.T-KX.Y, RMO.T-SX)"**

**Comparison of ...**

Technical Protocol<sup>i</sup>

Main authors and affiliations<sup>ii</sup>

Date:

Version:

### 1. Introduction

- Initiator of the comparison<sup>iii</sup>
- Objectives, quantity and range of the comparison
- Reference documents followed in drawing the technical protocol

### 2 Participants:

- List of participant laboratories (contact persons, their mailing and electronic addresses can be placed in a separate appendix)
- Roles (coordinating group preparing the technical protocol, pilot(s), co-pilot(s), sub-pilot(s), ...)

### 3 Comparison methodology

- Topology of the comparison (loops, circulation scheme, ...)
- Starting date and detailed timetable<sup>iv v</sup>

### 4. Travelling standard(s)

- Detailed description of the device(s) (make, type, serial number, size, weight, packaging, ... and technical data needed for its operation)
- Advice on handling the travelling standard(s), including unpacking, subsequent packing and shipping to the next participant<sup>vi</sup>
- Tests to be carried out on the travelling standard(s) upon receipt before measurement
- Conditions of use of travelling standard(s) during measurement
- Final tests before packaging the travelling standard(s) and ship it to the next laboratory
- Procedure in the case of failure of the travelling standard(s)

### 5. Organizational aspects

- Procedure in the case of unexpected delay at participating institute
- Customs formalities and documents to accompany the travelling standard(s) (ATA carnet or others)<sup>vii</sup>
- Financial aspects: responsibility for travelling standard(s) costs, transport costs, customs charges, damage costs<sup>viii</sup>
- Insurance on travelling standard(s)<sup>ix</sup>

## **6. Communication flows<sup>x</sup>**

- From participant to pilot: informing the pilot of the arrival of the travelling standard(s)
- From participant to pilot: communicating measurement delays to the pilot
- From participant to participant informing the next participant when shipping the travelling standard(s)
- From participant to pilot: communicating the measurement results to the pilot
- Due dates and consequences when failing to comply with due dates

## **7. Measurement instructions and procedures**

- Measurement instructions (state if there are any specific instructions)
- Measurement procedures (state if there are any specific procedures)

## **8. Reporting the results<sup>xi</sup>**

- Instructions for reporting the results of tests carried out on the travelling standard(s) upon receipt before measurement
- Instructions for reporting the measurement results (Excel<sup>®</sup> sheet)
- Instructions for reporting the uncertainties (Excel<sup>®</sup> sheet)<sup>xii</sup>
- Instructions for reporting additional information

## **9. KCRV and Linkage mechanism**

- For CIPM KCs: method for calculating the KCRV and its uncertainty
- For RMO KCs: method for linking to the KCRV of the parent CIPM KC

## **10. Document revision history<sup>xiii</sup>**

## Template for Final Report

**"Acronym (CCT-KX, RMO.T-KX.Y, RMO.T-SX)"**

**Comparison of ...**

Report (Draft A)<sup>xiv</sup>

Authors<sup>xv</sup>

Date:

Version:

### **1. Introduction**

- Objectives, quantity and range of the comparison
- Short history of the comparison (the comparison was initiated on..., the protocol was approved on..., the measurements were performed between... and..., ...)

### **2 Participants:**

- List of participant laboratories (contact persons, their mailing and electronic addresses can be placed in a separate appendix)
- Roles (coordinating group preparing the technical protocol, pilot(s), co-pilot(s), sub-pilot(s), ...)

### **3 Comparison Pattern**

- Topology of the comparison (loops, circulation scheme, ...)

### **4. Travelling standard(s)**

- detailed description of the device(s) (make, type, serial number, size, weight, packaging, ... and technical data needed for its operation)

### **5. Equipment and measuring conditions at participating laboratories**

- Specific measurement instructions or procedures (if any)
- Detailed description of equipment and measuring conditions at participating laboratories

### **6. Measurement results**

- Measurement results at each participating laboratory, including uncertainty of each participating laboratory (the full uncertainty budgets must be reported but can be placed in a separate appendix)

### **7. Analysis of the results**

- Determination of the bilateral equivalence between the participating laboratories (for all comparisons)
- Determination of the KCRV (only for CIPM KCs) and its uncertainty

- Determination of the DoE's (for CIPM KCs and RMO KCs the DoE's must be explicitly reported)
- Linkage to the parent CIPM KC (for RMO KCs)

## 8. Conclusions

- Concluding remarks (were the objectives achieved?)
- Lessons learned: recommendations for future comparisons

## 9. Appendices

- Approved protocol
- Document control history (changes applied to the report to address reviewers' comments, ...)

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<sup>i</sup> In accordance with CIPM MRA-D-05, Section 4.4.

<sup>ii</sup> The coordinating group or, in those cases where there is no coordinating group, the author of the pilot institute.

<sup>iii</sup> Including reference to the CC or RMO TC where approval has been received. Indicate RMO TC project identifier where applicable.

<sup>iv</sup> Protocol should be approved before the comparison is started.

<sup>v</sup> It is recommended that the detailed timetable be included as an appendix to the protocol as it is often revised to operational reasons and this simplifies the subsequent protocol revisions.

<sup>vi</sup> This should include a complete list of the content of the package including handbooks, ... and the weight and the size of the whole package.

<sup>vii</sup> See CIPM MRA-D-05, Section 4.5.

<sup>viii</sup> In general, each participating institute is responsible for its own costs for the measurements, transport and any customs charges as well as any damage that may occur within its country. Overall costs of the organization of the comparison, including the supply of the transfer devices, are normally born by the pilot institute.

<sup>ix</sup> Insurance of transfer decided by agreement among the participants taking account of the responsibility of each participant for any damage within its country.

<sup>x</sup> See CIPM MRA-D-05, Section 4.6. It is recommended that standard reporting forms with the relevant information be included in an appendix.

<sup>xi</sup> Early communication helps to reveal problems with the travelling standard during the comparison.

<sup>xii</sup> List of the principal components of the uncertainty budget to be evaluated by each participant, and any necessary advice on how uncertainties are estimated (this is based on the principles laid out in the ISO Guide for the Expression of Uncertainty in Measurement). In addition to the principal components of the uncertainty, common to all participants, individual institutes may add any others that they consider appropriate.

<sup>xiii</sup> A table with the fields, version, date, description and changes should be included as an appendix at the end of the document to facilitate document control.

<sup>xiv</sup> In accordance with CIPM MRA-D-05, Section 4.7, 5.3 or 7.2, as appropriate.

<sup>xv</sup> The pilot institute is responsible for writing the report. For authorship of the report, see CIPM MRA-G-04.