

Guidelines for preparing CCPR Key Comparisons

CCPR Working Group on Key Comparisons

CCPR-G4, July 1, 2013

These guidelines are prepared by CCPR WG-KC and approved by CCPR to ensure that CCPR Key Comparisons are prepared and performed in efficient and uniform manner and that the results be analyzed appropriately. This document is to supplement the CIPM guidelines on measurement comparisons [1]. This document does not cover RMO Key and Supplementary Comparisons and bilateral comparisons, for which other Guideline documents are available. The process of the data analysis and the report preparation is described in the *Guidelines for CCPR Key Comparison Report Preparation* [2]. This document is to replace *Guidelines for Acceptance of CCPR Key Comparison Participants* (Sep. 18, 2009).

1. Appointment of pilot laboratory

- 1.1 The pilot laboratory is appointed by WG-KC.
- 1.2 The pilot laboratory is responsible for developing the comparison protocol in consultation with the comparison's Task Group, preparing and distributing transfer standards (transfer standards may be prepared by participants), conducting measurements of all transfer standards to provide linkage with all participants' results, and preparing the comparison report.
- 1.3 The pilot laboratory of a CCPR KC shall be a participant of a previous CCPR KC of that quantity, unless the comparison is a new one.
- 1.4 It is important that the pilot laboratory is capable of achieving a high reproducibility (small statistical uncertainty), but not necessarily a small systematic uncertainty in the realization for the comparison quantity in order that a reliable link to the results of other participants is obtained.

2. Call for participants

- 2.1 The pilot laboratory and WG-KC chair prepare a Call for participants and send it to the CCPR Executive Secretary, who will distribute it to all CCPR member NMIs (not including observers). The call shall contain the information on the comparison quantity and relevant information such as wavelength range, geometrical conditions, etc. as applicable. An example of a call for participants is provided in Appendix A. Deadline of application is normally two months after the date of circulation.
- 2.2 The Call for participants should mention that the criteria and procedures specified in section 3 of this document will be applied to select participants. However, if fewer than 12 participants are expected, the Call for participants may state that those laboratories that do not meet the criteria may still send an application in case some of the criteria are dropped in special circumstances.
- 2.3 The Call for participants should include an application form, which requests the information needed to apply the acceptance criteria in 3.1. An example of an application form is attached in Appendix B.

- 2.4 After the Call for participants is sent, the pilot laboratory, if not already a member of WG-KC, becomes a temporary member of WG-KC.

3. Acceptance of participants

- 3.1 The following criteria will be used to select participants
- 3.1.1 The participant must be a member of CCPR.
 - 3.1.2 The participants must be willing to serve as link laboratories to their RMO.
 - 3.1.3 The participant must have an independent realization of the unit or scale of the comparison quantity
 - 3.1.4 The participant's measurement capability of the comparison quantity, over the full range of the comparison (e.g., full spectral range), must be listed in the CMC table published at the time of the call for participants.
- 3.2 For newly established Key Comparisons, 3.1.4 is not required.
- 3.3 In some exceptional circumstances, WG-KC can be consulted for changes of the criteria above for a particular comparison. (e.g., if the total number of qualified applicants is much smaller than 12, the CMC table requirement in 3.1.4 and/or other requirements in 3.1 may be dropped.)
- 3.4 If the total number of qualified applicants including the pilot laboratory is 12 or fewer, all the qualified applicants are accepted as participants.
- 3.5 If the total number of qualified participants exceeds 12, each RMO Group will limit the participants as below. The pilot laboratory sends a request to each RMO, in which the number of participants exceeds the maximum value in the table.

		Maximum number of participants
Group 1	EURAMET+COOMET	6
Group 2	APMP+AFRIMETS	4
Group 3	SIM	2

- 3.5.1 The choice of the method for selecting participants is up to each RMO Group.
- 3.5.2 In Group 1 and Group 2, there is no obligation that NMIs from both listed RMOs must participate. If one of the RMOs does not participate, the other RMO in the Group should provide the link to the RMO that does not participate.
- 3.5.3 Those laboratories that are dropped by this selection process are entitled to participate in the corresponding RMO KC, which will provide supporting evidence in CMC claims in the same way as a CCPR KC does.

4. Preparation of Technical Protocol

- 4.1 Once the list of participants is finalized, a Task Group for the comparison will be formed. Task Group members are selected among the participants and appointed by WG-KC. The pilot laboratory should send a proposal of Task Group members to the WG-KC chair, and it should be approved by WG-KC.

- 4.2 The technical protocol is developed by the pilot laboratory and the Task Group of the comparison, and to be approved by all participants.
- 4.3 The technical protocol should describe a sequence of measurements that allows the stability of the transfer standards to be verified. The measurement sequence should include at least one of the following elementary patterns:
- A) Transfer standards are first measured by the pilot laboratory, sent to each participant for their measurement, then sent back to the pilot laboratory for the second measurement. (Pilot – Participant – Pilot)
- B) The transfer standards are first measured by each participant, sent to the pilot laboratory for their measurements, then sent back to each participant for the second measurement. (Participant – Pilot– Participant)
- 4.4 The technical protocol should include the following information.
- 4.4.1 Complete specification of the comparison quantity, wavelength range and geometrical conditions, as applicable.
- 4.4.2 The pilot laboratory and the list of participants (NMIs) and their contact information.
- 4.4.3 Time table (month, year) including
- delivery of transfer artifacts to each participant (if the pilot laboratory prepares transfer artifacts) or submission of transfer artifacts and results by each participant (if each participant prepares the artifacts)
 - measurements by each participant and pilot laboratory
 - distribution of Pre-Draft A data (stability of artifacts and internal consistency), following the *Guidelines for CCPR Key Comparison Report Preparation* [2].
 - distribution of Draft A
 - A statement that participants will be given a deadline date for submitting the results, and if they do not meet the deadline, they will be disqualified.
- 4.4.4 Description of transfer artifacts. If the participants are to procure the artifacts, the detailed product information of the artifacts.
- 4.4.5 Advice on handling the travelling standards, including unpacking and subsequent packing and shipping for return. Detailed operating conditions of the transfer artifact including electrical parameters and method for alignment.
- 4.4.6 Instructions to perform measurements using the facilities and procedures that the participant laboratory normally uses for their calibration services, while meeting the conditions of measurement specified by the technical protocol.
- 4.4.7 Instructions for submitting the measurement results including the uncertainty (attach a form) for each transfer standard. If the participants perform measurements in two rounds (before and after measurement by pilot laboratory), they must send the results after each of 1st and 2nd measurement. The results of the 1st measurement can be treated as preliminary and these can be revised if necessary when the 2nd measurement results are submitted.
- 4.4.8 Instructions to submit the information listed below. These should be submitted before or at latest at the time of submitting final measurement

results.

- traceability of the scale of the comparison quantity of the laboratory
 - detailed uncertainty budget, including the list of uncertainty contributions identifying uncertainty components related to correlated and uncorrelated effects between measurements rounds, for the laboratory's measurement of the comparison quantity (general one for the quantity, not for each individual transfer artifact). The protocol shall include a list of the typical uncertainty contributions to include in the budget.
 - description of the laboratory facility for the quantity
- 4.4.9 Method of data analysis, which should follow the *Guidelines for CCPR Key Comparison Report Preparation* [2]. Any deviations from the recommended methods should be justified and explained in detail.
- 4.5 The technical protocol must be distributed to and approved by all participants. It is highly recommended that prior to approval, the protocol is clearly labeled "DRAFT" on all pages. Once approved (Section 5.1 and 5.2) a final version should be distributed as PDF, and labeled as "Final Approved Protocol".

5. Approval of the protocol by WG-KC and registration to KCDB

- 5.1 Upon completion of the technical protocol, the pilot laboratory sends it to the WG-KC secretary (copy to WG-KC chair) who will distribute it to WG-KC for approval or comments.
- 5.2 After the technical protocol is approved, the pilot laboratory sends the KCDB entry form and the Final Approved Protocol to the CCPR Executive Secretary, who will confirm reception and pass it on to the KCDB manager.
- 5.3 Upon the registration of the comparison in the KCDB, the comparison is given a designation as CCPR-Kx.YEAR (e.g., CCPR-K6.2010); YEAR is the year of registration in the KCDB.

6. Monitoring the comparison

- 6.1 After the comparison is registered in the KCDB and during the process of the comparison (until the report is published), pilot laboratories are required to send a progress report of the comparison to the participants, the WG-KC Secretary, and the CCPR representative of the pilot laboratory NMI every six months (January and July as default).
- 6.2 If significant delay occurs, the pilot laboratories are required to notify the participants, WG-KC Secretary, and the CCPR representative of the pilot laboratory NMI promptly at any time in between the periodic reports.
- 6.3 The WG-KC Secretary will remind the pilot laboratory to submit the status report as required above.

7. Measurement

- 7.1 Measurement can start upon the approval of the protocol by WG-KC.
- 7.2 When the pilot laboratory sends out transfer standard artifacts to a participant, a deadline for submitting the results should be given to the participants, in agreement

with the time table in the technical protocol (4.4.3). The deadline is determined considering transportation time and to allow reasonable time for measurement.

- 7.3 Participants and pilot laboratory should inform each other upon receipt of the transfer standards.
- 7.4 If a participant fails to submit the results by the deadline (except for the special reasons such as failure of artifacts), the participant will be disqualified. This decision, proposed by the pilot, is to be agreed by all other participants.

8. Data Analysis and Publication of Report

Follow *Guidelines for CCPR Key Comparison Report Preparation* [2].

References

1. CIPM MRA-D-05, Measurement comparisons in the CIPM MRA, Version 1.3, available at http://www.bipm.org/utils/common/CIPM_MRA/CIPM_MRA-D-05.pdf
2. CCPR-G2, *Guidelines for CCPR Key Comparison Report Preparation*, Rev. 3, July 2013.

Appendix A. An Example of a Call for Participants

Call for Participants Second-round CCPR Key Comparison K2.b Spectral Responsivity 300 nm ~ 1000 nm Date xxxx-xx-xx

Based on the decision made at the CCPR meeting in 2007, the second round Key Comparisons are organized by the Working Group on Key Comparisons (WG-KC). CCPR K2.b spectral responsivity 300 nm ~ 1000 nm is now being prepared with <name of NMI> appointed as the pilot laboratory.

The comparison artifacts to be used in this comparison will be single-element Si photodiodes and/or Si trap detectors similar to those used in the previous K2.b in order that the results of these comparisons can be directly compared. The full details of the comparison protocol will be established by a task group drawn from the participants including the pilot laboratory.

There will be no fee charged for participation. The comparison artifacts may be prepared by <name of NMI> or by the participants (in which case participants may have to purchase the artifacts and screen them). This decision will be made by the task group.

The WG-KC is now calling for CCPR member laboratories to participate in this comparison. This comparison will follow the procedures in the *Guidelines for Preparing CCPR Key Comparisons* (Rev. 3, July 2013). After submitting the application form, qualification of your laboratory will be reviewed and participants may need to go through a selection process.

An application form (in MS Word format) is attached with this invitation. Laboratories committed to participating are asked to return this form to the WG-KC chair (email address) and the pilot laboratory (email address) by **xxxxx xx, 20xx**. Responses received after this deadline will not be accepted.

Sincerely,

Xxxx xxxx, Pilot laboratory of the 2ndCCPR K2.b
Xxxx xxxx, CCPR WG-KC Chair

Appendix B. An Example of Application From

Application Form
2nd CCPR Kx xxxxxxxxx

Laboratory	
Full name (acronym)	
Mailing Address (for delivery)	
Nominated lead person	
Name (and title)	
Email	
Phone	
Mailing address	
Laboratory details	
CCPR membership (member/observer)	
RMO membership (which RMO)	
Your laboratory's CMC for xxxxxx as listed in the current CMC list (full details including wavelength ranges and uncertainties).	
Any changes of your CMC from the current list.	
Does your laboratory have independent scale realization? (if partially, the wavelength region)	
List of comparisons your laboratory participated in the past on xxxxxxxx, including CCPR, RMO, bilateral, and informal comparisons.	
Do you wish to serve on the Task Group?	
Date of submission	