

## Technical supplement to the arrangement

### CIPM revision 2003

At its 92nd meeting, in October, 2003, the CIPM approved proposals from the JCRB for modifications to the Technical Supplement of the CIPM MRA. These concern paragraph **T.7**, stating that unresolved inconsistencies resulting from supplementary comparisons will be noted in Appendix C, and paragraph **T.10**, clarifying that supplementary comparisons are only carried out by RMOs\*. The following is the revised text with the changes highlighted. Underlined text has been added and barred text deleted.

The technical basis for this arrangement is the set of results obtained during the key comparisons carried out by the Consultative Committees, the BIPM and the RMOs (paragraph 3.1). The following specify conventions and responsibilities relating to the key comparisons.

- T.1** CIPM key comparisons lead to reference values, known as key comparison reference values.
- T.2** For the purposes of this arrangement, the term degree of equivalence of measurement standards is taken to mean the degree to which a standard is consistent with the key comparison reference value. The degree of equivalence of each national measurement standard is expressed quantitatively by two terms: its deviation from the key comparison reference value and the uncertainty of this deviation (at a 95 % level of confidence). The degree of equivalence between pairs of national measurement standards is expressed by the difference of their deviations from the reference value and the uncertainty of this difference (at a 95 % level of confidence).
- T.3** Although a key comparison reference value is normally a close approximation to the corresponding SI value, it is possible that some of the values submitted by individual participants may be even closer. In a few instances, for example in some chemical measurements, there may be difficulty in relating results to the SI. Nevertheless, the key comparison reference value and deviations from it are good indicators of the SI value. For this reason, these values are used to express the degree of equivalence between the standards of participating laboratories. In some exceptional cases, a Consultative Committee may conclude that for technical reasons a reference value for a particular key comparison is not appropriate; the results are then expressed directly in terms of the degrees of equivalence between pairs of standards.

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\* The definition of a supplementary comparison in the Glossary (page 44) has been revised in accordance to this modification.

- T.4** The results of the RMO key comparisons are linked to key comparison reference values established by CIPM key comparisons by the common participation of some institutes in both CIPM and RMO comparisons. The uncertainty with which comparison data are propagated depends on the number of institutes taking part in both comparisons and on the quality of the results reported by these institutes.
- T.5** The results of the CIPM and the RMO key comparisons, the key comparison reference values, the deviations from the reference values and their uncertainties, together with other information necessary for their interpretation, are published by the BIPM and entered into the key comparison database.
- T.6** CIPM and RMO key comparisons must be carried out following the Guidelines for CIPM key comparisons published by the BIPM and available on the BIPM Web page.
- T.7** For calibration and measurement certificates, the quantities, ranges and calibration and measurement capabilities expressed as an uncertainty (normally at a 95 % level of confidence but in some cases it may be at a higher, specified, level), 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. If, as a result of a key comparison, a significant unresolved deviation from the key comparison reference value persists for the standard of a particular participating institute, the existence of this deviation is noted in Appendix C. [The same applies for significant inconsistencies resulting from a supplementary comparison.](#) In this case, the institute has the choice of either withdrawing from Appendix C one or more of the relevant calibration and measurement services or increasing the corresponding uncertainties given in Appendix C. The calibration and measurement capabilities listed in Appendix C are analysed by the Joint Committee following the procedures given in 7.3 above. The calibration and measurement capabilities referred to in this paragraph 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.
- T.8** Responsibilities of the Consultative Committees: the Consultative Committees have a prime role in choosing and implementing key comparisons and in affirming the validity of the results. Their particular responsibilities are:
- a) to identify the key comparisons in each field and maintain a current list (Appendix D);
  - b) to initiate and organize, with the collaboration of the BIPM, the execution of key comparisons at intervals to be decided individually for each comparison;
  - c) to review the results of CIPM key comparisons and determine the reference values and degrees of equivalence on the basis of the proposals of the appropriate working groups;

- d) to approve the final report of CIPM key comparisons for publication by the BIPM;
- e) to examine and confirm the results of RMO key and supplementary comparisons and incorporate them in Appendix B and the key comparison database;
- f) to examine and confirm the results of bilateral key comparisons for entry into Appendix B and the key comparison database.

**T.9** RMO key comparisons: the RMO key comparisons extend the metrological equivalence established by the CIPM key comparisons to a greater number of national metrology institutes including those of States or Economies that are Associates of the CGPM. Redundancy, coherence and timeliness are important aspects of regional comparisons for they ensure that the overall system of comparisons is robust. Regional organizations therefore have a particular responsibility for ensuring that:

- a) links with the CIPM key comparisons provide adequate redundancy through the participation of a sufficient number of laboratories in both sets of comparisons to ensure that links to the key comparison reference values are established with acceptably low uncertainty;
- b) the procedures used in regional comparisons, and the evaluation of the results and uncertainties, are compatible with those used in the CIPM key comparisons;
- c) the timing of the RMO key comparisons is coordinated with, and is at least as frequent as, those of the CIPM key comparisons;
- d) the results of RMO key comparisons are carefully evaluated by the RMO, which also takes responsibility for ensuring that the proper procedures have been followed, and then the results are submitted for publication and to the relevant CC for incorporation in Appendix B and the key comparison database;
- e) the results of appropriately performed bilateral comparisons are considered and then submitted to the relevant Consultative Committee for incorporation in Appendix B and the key comparison database;
- f) in the case that an RMO key comparison takes place before the corresponding CIPM key comparison, the link to the subsequent key comparison reference value is deferred until both key comparisons are completed.

**T.10** Supplementary comparisons: in addition to the key comparisons, ~~the Consultative Committees,~~ the RMOs ~~and the BIPM~~ may carry out supplementary comparisons to meet specific needs not covered by key

comparisons, including comparisons to support confidence in calibration and measurement certificates.

The Joint Committee of the RMOs and the BIPM (see paragraph 9.3 above) provides a forum for the coordination, among the regions, of the supplementary comparisons carried out by the RMOs in order to bolster confidence in calibration and measurement certificates.