Claudine THOMAS
Coordinator of the BIPM key comparison database
BIPM
cthomas@bipm.org

30 September 2002

KCDB REPORT AS ON 30 SEPTEMBER 2002

The BIPM key comparison database Website is available at http://www.bipm.org/kcdb. The latest news and main historical events are accessible from the Home page by clicking on "News". We describe here the status of the KCDB at the time of the 9th JCRB meeting and outline questions or problems encountered that may be of interest to the JCRB.

1. Appendix C

Appendix C content

The successful implementation of the interactive JCRB Website at http://www.bipm.org/JCRB and its use for electronic approval of CMC files have greatly facilitated the work.

Since the 8th JCRB meeting, the following sets of CMCs have been published:

- Amount of Substance (General Chemistry), declared via APMP, COOMET, EUROMET and SIM (publication: 14 February 2002 - 12 March 2002);
- Mass and Related Quantities, declared via APMP (publication: 27 March 2002, Malaysia: 14 June 2002, Japan: 23 August 2002), via SIM (publication: 05 July 2002), via EUROMET (publication: 11 July 2002 – 23 August 2002), and via COOMET (02 October 2002);
- Ionizing Radiation (very first sets in Dosimetry), declared via COOMET and SADCMET (publication: 26 April 2002) and by the International Atomic Energy Agency (publication: 19 June 2002);
- Acoustics, Ultrasound and Vibration, declared via COOMET (publication: 07 June 2002) and via EUROMET (publication of a first revised set: 07 June 2002, publication of a second revised set: 05 July 2002).

Hence, by 30 September 2002, Appendix C included:

- 11543 CMCs declared in the fields of Photometry and Radiometry, Electricity and Magnetism, Length, Acoustics, Ultrasound and Vibration, and Mass and Related Quantities;
- 2137 CMCs declared in the field of Amount of Substance; and
- 48 CMCs declared in the field of Ionizing Radiation.

No CMCs in Thermometry and Time and Frequency have so far been approved by the JCRB.

A total of some **13700 CMCs** are thus currently available to users. This is still much less than the final total we expect for Appendix C: many CMCs are still missing, especially in the areas of Chemistry, Thermometry and Ionizing Radiation.

The field of Electricity and Magnetism is far ahead of the others: RMOs are now refining their CMC files published in March 2001, taking into account new results of key comparisons and progress made by NMIs towards establishing their Quality Systems. For most other Metrology areas, the full lists of CMCs have not yet even been collected from the NMIs and the lists that are published are sometimes still limited to services directly linked to key comparisons. Furthermore, the situation may be quite different from one RMO to another.

The main problem encountered so far arises from the changes to the Classifications of Services agreed among the RMOs. Remember that the search engine proposed for accessing Appendix C information relies upon these Classifications (except in the area of Chemistry).
Even if the addition of a new service to the list has no impact on existing CMCs, concatenating two services into one and subsequently changing the numbering of most of the other services creates two different types of CMC files, which cannot co-exist in the same database.
We shall have to address this issue shortly for CMCs in Electricity and Magnetism, since EUROMET is basing its new files on Classification Version 7.2 while all other current RMO files use Classification Version 6. We shall handle this specific case thanks to the help of the relevant RMO Technical Committee Chairs. **We suggest, however, that the JCRB recommends that RMO Technical Committee Chairs contact the KCDB Coordinator in order to adapt the numbering of services when changes are deemed necessary in the Classifications of Services.**

Some approved CMCs are declared by laboratories that are not yet participants in the MRA. In these cases, the KCDB Coordinator alerts the Director of the BIPM. Subsequently, a message is sent to the Director of the relevant NMI who has signed the MRA in order to request the designation of the laboratory in question. **Until a designation is officially declared, the relevant CMCs cannot be published in the KCDB, even if they have been officially approved by the JCRB.**

<u>Appendix C design</u>

The design of the KCDB Appendix C has evolved significantly since the last JCRB meeting, as given below:

- The Appendix C Chemistry has been extended to cover all categories, and a filter has been applied to the Chemical category in the search engine.
- The Appendix C Ionizing Radiation has been created, using a new search engine based on the selection of a “Quantity”, a “Source” and a “Medium” (the radionuclide may be entered as a keyword).
- A facility for publishing tables of uncertainty has been created (not yet on-line). A large number of CMCs corresponding to the same measurand (e.g., “Voltage”), which can take a number of different values, and to the same parameter (e.g., “Frequency”), which can also take a number of different values, may be concatenated into one single CMC. The relevant uncertainty is then described with a table giving the complete set of uncertainty values (one value for one Voltage value –or range- and one Frequency

value –or range-). This facility was requested in December 2001 by the Electricity community, but could equally well be applied in the Photometry area.

2. Appendix B

Appendix B content

By 30 September 2002, 457 CIPM and RMO key and supplementary comparisons were recorded in the Appendix B database. A total of 63 new comparisons have thus been registered since the last JCRB meeting. While some of these are new comparisons identified by the CCs, most are RMO key comparisons directly corresponding to the CC key comparisons that had not yet been declared.
However, this process is not yet complete: we are still missing many key and supplementary comparisons, especially those conducted within APMP and SIM. We take the opportunity provided by CC meetings held at the BIPM to approach RMO Technical Committee Chairs in order to accelerating the exchange of information.

Appendix B now displays the results for some 44 comparisons in the form of individual laboratory measurements, equivalence statements (for key comparisons only), degrees of equivalence (for key comparisons only), and various graphs, in particular graphs of equivalence.

Three EUROMET key comparisons have now had their results linked to those of the corresponding CC key comparison: one in the field of Mass and Related Quantities (High Pressure), one in the field of Chemistry (Gases) and one in the field of Electricity (Capacitance).

The "yellow section" of the matrix of equivalence (which includes the **degrees of equivalence by pairs of laboratories**) is generally considered difficult to build and to read, and discussions are underway as to whether it is useful or not. In brief, the argument is two-fold:

- We note that visitors to the KCDB are interested in accessing graphs of equivalence and pay little attention to pair-wise degrees of equivalence.
- However, correlations among comparison participants have an impact on the computation of pair-wise degrees of equivalence, which may result in uncertainty values that are smaller than those of degrees of equivalence relative to the key comparison reference value.

The database currently displays pair-wise degrees of equivalence for all but 5 of the key comparisons "approved for equivalence". In the cases where this information is not displayed the user has access to formulas or to explanatory notes.

Another point now being debated within the CC or Working Group meetings is the **usefulness of displaying the results of supplementary comparisons via the KCDB**. Again, the argument is two-fold:

- Two CC supplementary comparisons have already had their results published in the KCDB, so a precedent has been created.

- The Final Report of the comparison, however, may often be sufficient for supporting CMC claims, and the Pilot Laboratory would be saved a great deal of time and effort if does not have to prepare the EXCEL file of results required for the KCDB. This is especially true in the case where a supplementary comparison was undertaken in order to complete a large number of "complementary" measurements (for example, CCEM.RF-K21.F and CCEM.RF-S21.F).

This is a matter which perhaps simply calls for flexibility. Until now, completed RMO supplementary comparisons are recorded in the KCDB with the status "published", and a reference given. This procedure could well be extended to CC supplementary comparisons.
The MRA makes no statement regarding what must be published in the KCDB as regards a supplementary comparison, so we are free to choose.

Appendix B design

Since April 2002, a considerable amount of effort has been devoted to the improvement of the underlying database structure and the development of new Web programming for Appendix B, mainly to address users requirements. We resolve these purely technical matters with the assistance of an external international company based in France, whose advice and products make it possible to profit from the best available techniques using optimal programming methods. Any modifications in design, however, are handled by the BIPM.

We are using this opportunity to apply the new Web features of the general BIPM Website to the KCDB Website. We intend to launch this on the Web in January 2003.

3. Visits, publicity, staff

Visits to the KCDB

The number of external connections to the KCDB Website is increasing continuously: we received a little more than 3000 visits in August 2002. As it is still very difficult to identify who is visiting the KCDB, we intend to provide an option on-line registration form for visitors.

Publicising the KCDB

We try to publicise the KCDB as often as we can through, for example, the publication of papers in Newsletters, the presentation of posters at Congresses and the wide distribution of the KCDB leaflet.
We demonstrated the KCDB live on the Web on the NIST stand at the conference PITTCOM'2002 in March 2002. We are grateful to NIST for their hospitality on this occasion.
The KCDB was also demonstrated live to an audience of European regulators and trade representatives at a Workshop held at the IRMM in Belgium in May 2002.

New staff member

Dr Stéphanie Maniguet was appointed Research Fellow at the BIPM for a period of two years, beginning on 17 June 2002. She is working on the development and the maintenance of the KCDB.