Towards a sustainable CIPM MRA

1. Context

The CIPM MRA has been very beneficial to the metrology community. Due to its complexity, the CIPM MRA requires high metrological expertise of all related actions, and appropriate associated logistics. Some further suggestions are given on how to implement the CIPM MRA in a more efficient way in order to secure its success for the future.

The main achievements of the CIPM MRA are:
- The potential removal of technical barriers to trade
- The mutual acceptance of calibration certificates issued by NMIs and DIs
- The mutual confidence through a peer reviewed system, underpinned by measurement comparisons
- Worldwide harmonized realisations of the SI units and measurement standards
- Provision of traceability routes
- Improved measurement capabilities of many NMIs and DIs (incl. the establishment of the tools to monitor and to quantify these capabilities).

The success comes at a price. The maintenance of the various processes defined to support the CIPM MRA (comparisons, CMC review, and QMS review) binds substantial resources at the participating institutes, the consultative committees of the CIPM and the technical committees within the RMOs. It is time to reflect on possible measures to make the CIPM MRA more efficient and as sustainable as possible. A balance between economic viability and the rigour in the implementation of the agreement has to be found.

2. What are the issues?

The main challenge is the continuous growth in the number of comparison activities and the number of CMC entries. In the face of limited budgets it is becoming more and more difficult to find coordinators for comparisons or reviewers for CMC submissions. There is a risk that the system will become unmanageable, and as consequence, the initial objectives of the CIPM MRA cannot be accomplished in the long term.

Another important difficulty, linked to the big and steadily increasing number of CMCs, is the maintenance of the existing CMC entries. To ensure the validity of the entries over time, regular re-evaluations should be carried out. This process is not established yet.

There are a number of technical issues in connection with the CMC review process. This was discussed in a EURAMET paper submitted to the JCRB in March 2012. Several of these issues are being addressed since then.

There are shortcomings in the KCDB:
- The CMC entries vary a lot in their form, making it difficult for customers to compare services from different NMIs/ DIs.
As a consequence of the long review processes, the published CMCs often do not reflect the actual services available at the member institutes.

- The KCDB is an important source of information for the member institutes and for accreditation bodies, but—as customer surveys illustrate—the KCDB is hardly known and used by customers.

3. **Towards a more sustainable system**

To move forward in the development of the CIPM MRA towards a more sustainable system, a three step process is proposed:

1. **Define the needs.**
   The principles of the CIPM MRA are laid down in the original text of the arrangement signed by the NMIs. The current “mise en pratique” of the CIPM MRA, however, is mainly the result of a bottom-up process: Technical experts have done their best to implement a comprehensive system without detailed cost-benefit analysis. After more than 10 years of operation, it is time to reflect again on the practical implementation of the arrangement: What kind of functionalities do we need from the KCDB? To which level are the services of a member institute reviewed and backed-up by comparisons? The RMOs and the NMI directors should express their view on these points more clearly than this was done so far.

2. **Simplify the system.**
   The implementation of the CIPM MRA should be as simple as possible. Presently, the calibration and measurement capabilities are defined in most of the fields in a very comprehensive and detailed way. Up to three levels of subcategories are defined per service category. Every time, a new method, new type of device under test or an extension of the measurement range is implemented, the list of services becomes longer. Possible measures towards simplification could be e.g.:

   - CMC are set-up up to the level of the calibration or measurement method. As a consequence, it may happen that for the same measurands and the same quantity range, several CMC entries with differing uncertainties exist. A simple measure would be to declare only the entry with the lowest uncertainty and to leave it to the NMI/DI to assure the traceability of other services with higher uncertainties.

   - Another possibility is to simplify the scheme of the service categories. In many fields it would be possible to remove e.g. the third level in the structure (sub-sub-categories). In this case, the CMC line would indicate the quantity range and the two extreme values for the uncertainty. The detailed information could then be presented in annexed matrix files. This approach was recently proposed by the EURAMET-TCEM to the CCEM; it is implemented in a weakened form in a running CMC review batch (EURAMET.EM.9.2013-EM.10.2013, EM.11.2013).

   - One way out could be to declare in the KCDB only a limited set of “key services”. These key services, to be defined by the CCs, would represent the best capability of a NMI/DI in a specific field and only this best capability would be reviewed in the intra- and inter-RMO processes. The rest of the services relying on these key services are declared and maintained by the NMI/DI in their own management system. This would be a more radical change of current practice and requires mutual confidence. The rules and requirements for such a scheme are still to be defined.
3. **Improve the efficiency.**

Once the needs and the concept are defined, the procedures and tools for the implementation can be developed. In the past few years, efforts were made to improve the efficiency of the present system, such as: harmonization of the CMC review processes among the RMOs, implementation of strict deadlines in the review process; tighter control of the comparison schedules. More should be done:

- Develop a web based tool for the handling, management and review of the CMC entries. This was also previously proposed by EURAMET. With such a tool, all reviewers would work on the same data and no merging of multiple file versions would be necessary anymore. This would drastically reduce the workload for the reviewers, the TC chairs and the KCDB manager.

- Explore new schemes for the organisation of key comparisons. The major problem of key comparisons is that they take too much time. It is complicated to organise and to analyse a comparison with many participants. A step forward could be to organise the majority of the comparisons in the same way as the BIPM on-going key comparisons. An NMI/DI with a well-established and renowned expertise in a specific field could be ready to maintain such an on-going comparison for a certain time and offer bilateral comparisons to interested laboratories. Such bilateral comparisons are easy to organise and the analysis is much simpler than in the loop system with many participants.

- For “traditional” comparisons with several participants, which still will be needed in addition to the proposed new scheme, strict project management rules have to be implemented. Essential in this respect is a firm commitment of the participating institutes to follow the time schedule as indicated in the protocol. This is especially important for the piloting institute which has to provide substantial resources for the coordination and the analysis of the exercise. Other elements which should be considered are the implementation of hard deadlines, the sharing of pilot duties among several participants, and a close supervision by appropriate CC and/or RMO bodies.