FOREWORD

This is a compilation of documents covering the first years of operation of the JCRB. It begins with a summary Report covering the activities of the JCRB over the period 1999 to 2003. This is then followed by the meeting reports of the first ten meetings of the JCRB, the three annual Reports of the Chairman of the JCRB to the CIPM and to signatories of the MRA, and then the texts of various policy documents and interpretative statements of the JCRB related to the CIPM MRA.

This document is intended to provide a single reference for JCRB decisions and policies made during the four years since the signing of the CIPM MRA in October 1999.

In retiring from my post as Director of the BIPM in December 2003 and consequently as Chairman of the JCRB, I take this opportunity of thanking the very many people who have contributed to the success of the MRA during this time and who have been of enormous assistance to me as Chairman of the JCRB. I would like to mention specifically Claudine Thomas who undertook the tremendous task of creating and now maintaining the present BIPM key comparison database (KCDB), Angela Samuel who has acted for close to two years as Executive Secretary of the JCRB and all the RMO Representatives with whom I have worked on the JCRB during this very exciting period.

Terry Quinn

Director BIPM and Chairman of the JCRB

September 2003

ACTIVITIES OF THE JOINT COMMITTEE OF THE REGIONAL METROLOGY ORGANIZATIONS AND THE BIPM (JCRB)
1999 – 2003

ACTIVITIES OF THE JOINT COMMITTEE OF THE REGIONAL METROLOGY ORGANIZATIONS AND THE BIPM (JCRB) 1999 – 2003

Report by the Chairman of the JCRB to the CIPM and Directors of signatory institutes of the CIPM MRA.

INTRODUCTION

The Terms of Reference of the JCRB given in Appendix E of the CIPM MRA require an annual Report to the CIPM and to signatories of the MRA. The first such Report was provided in December 2000, after the first year of operation of the MRA, followed by annual Reports on activities in 2001 and 2002. This is an additional Report reviewing the first four years of operation of the CIPM MRA.

During the period 1999-2003, five Regional Metrology Organizations along with the BIPM have participated in the JCRB. These are: APMP (Asia-Pacific), COOMET (Central and Eastern Europe), EUROMET (Western Europe), SADCMET (Southern Africa) and SIM (the Americas – North and South).[1]

In February 2002, the post of Executive Secretary to the JCRB was created to deal with the increasing amount of work related to the Committee and its coordination of the review of calibration and measurement capabilities (CMCs) of the Signatory NMIs and designated institutes. This has turned out to be an essential innovation. It is now envisaged that the post of Executive Secretary of the JCRB will be a continuing, rotating appointment of two years, undertaken by an appropriately qualified person normally sent on secondment to the BIPM from a signatory NMI of the MRA[2].

The JCRB meets twice each year, the first meeting usually held in March and hosted by one of the Regional Metrology Organizations (RMOs) and the second meeting in October at the BIPM. The 11th JCRB meeting, due to take place in October 2003, will mark the last meeting before the end of the transition period of the CIPM MRA, set by the JCRB and approved by the CIPM as 31 December 2003.

In addition to my general remarks on the operation of the CIPM MRA during its first four years of operation, this Report contains a compilation of the principal documents that have been developed by the JCRB over this period. These are listed in the Contents and are also available on the BIPM website at:
http://www.bipm.org/enus/2_Committees/JCRB.shtml

At the time of writing this Report, JCRB documents are posted in one of three Sections on this page:

- Documents of general interest, accessible by all, in the Section “JCRB Documents”
- Documents of interest to members of RMO Technical Committees or Working Groups, in the restricted-access Section “JCRB Meeting Documents”

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[1] Another RMO, MENAMET (a grouping of NMIs from the Middle Eastern and North African region), was initiated in 1999 and participated briefly in the JCRB but its activity was not sustained due to regional issues.
[2] The first appointee in the role of JCRB Executive Secretary has been Dr A E Samuel of NML-CSIRO, Australia (RMO: APMP), from February 2002 until October 2003. Her successor has been appointed to take over the position for the period up to September 2005 and is Dr Ismael Castelazo Sinencio from CENAM, Mexico (RMO: SIM).

- Working documents for discussion by members of the JCRB at JCRB meetings, in the restricted-access Section "JCRB Working Documents".

MAIN ACTIVITIES SINCE THE INCEPTION OF THE JCRB

Since the first meeting of the JCRB held in February 1998 (thus pre-dating the establishment of the CIPM MRA), its main activities have been:

1. the coordination and management of reviews of NMI calibration and measurement capabilities (CMCs); and
2. the development of policy and guidelines on the operation of the CIPM MRA to assist the RMOs and the CIPM.

1. The coordination and management of reviews of NMI calibration and measurement capabilities (CMCs)

While initially CMCs were approved at meetings of the JCRB, by the end of 2001 the development of a purpose-built facility on the BIPM website to coordinate inter-regional reviews and approvals of CMCs meant that this needed no longer to be the case.

The new facility at: http://www.bipm.org/JCRB was initially created to enable JCRB members to provide updates on the progress of CMC reviews and to approve CMCs once reviews had been undertaken, outside and independently of JCRB meetings. After the 8th JCRB meeting in March 2002, access was extended to RMO Technical Committee/Working Group Chairmen to enable them to log relevant details of review discussions, in particular in cases where delays in reviews occur.

During the period since the signing of the CIPM MRA until the present, some 14,000 individual CMCs have undergone inter-regional review and approval and have subsequently been published in Appendix C of the KCDB. Published CMCs cover the areas of:

- Acoustics, Ultrasound and Vibration from APMP, COOMET, EUROMET, SADCMET and SIM;
- Amount of Substance – Gas mixtures and General Chemistry from APMP, COOMET, EUROMET and SIM;
- Electricity and Magnetism from APMP, COOMET, EUROMET, SADCMET and SIM;
- Ionizing Radiation from COOMET, SADCMET and the International Atomic Energy Agency (IAEA);
- Length from APMP, EUROMET, SADCMET and SIM;
- Mass and Related Quantities from APMP, COOMET, EUROMET and SIM;
- Photometry and Radiometry from APMP EUROMET, SADCMET and SIM.

Of these CMCs, as of 13 July 2003, 12,173 have been declared in the fields of Photometry and Radiometry, Electricity and Magnetism, Length, Acoustics, Ultrasound and Vibration, and Mass and Related Quantities; 2132 CMCs declared in the field of Amount of Substance; and 84 CMCs declared in the field of Ionizing Radiation.

However, at this time many CMCs are still missing, especially in the areas of Chemistry, Thermometry, Ionizing Radiation and Time and Frequency. In fact, no CMCs in Thermometry and Time and Frequency have so far been approved by the JCRB. As the technical basis for the CIPM MRA, the credibility and effectiveness of the MRA are wholly dependent on the data available in the KCDB. The JCRB is aware that the delays in approving CMCs in the identified areas have arisen in large part due to the process of reaching agreement between regions on important technical matters, but has urged the RMOs to identify means of overcoming these differences.

Delays have occurred and continue to occur because of the slow process of distributing information within RMOs and obtaining replies to comments or modifications to CMCs in

response to comments. For this reason the JCRB has encouraged meetings of RMO technical representatives at the time of Consultative Committees to sit round a table and resolve such issues all together. This is by far the most efficient way of coming to the end of the review process and has shown itself to be particularly successful in chemistry but also in other areas as well. The JCRB urges the CIPM to formalise this process by approving the creation of working groups under the Consultative Committees to be made up of RMO technical representatives in the corresponding field.

An extended delay in reaching final agreement is most disheartening for all those in NMIs who have worked to produce tables of CMCs. We should do our utmost to avoid this.

2. The development of policy and guidelines on the operation of the CIPM MRA to assist the RMOs and the CIPM

The JCRB has provided policy and guidelines to the CIPM and RMOs on a wide range of issues to assist participation, particularly in Part Two of the MRA, including the following:

- "Criteria for acceptance of data for Appendix C" [Doc JCRB-8/13(1b)] and "Procedure for modifying CMCs already in Appendix C" [Doc JCRB-8/10]
- Statement on NMI Calibration and Measurement Certificates for CMCs published in the KCDB
- "Definitions of terms used in the CIPM MRA – Calibration and Measurement Capability; Uncertainty Determinations for CMCs" [Doc JCRB-8/Action_28]
- Quality Systems: "JCRB Guidelines for the monitoring and reporting of the operation of Quality Systems by RMOs" [Doc JCRB-10/8(1c)]
- End of transition period: "Review of published CMCs" [Doc JCRB-9/12]; "Interpretation of Paragraph 11.3 of CIPM MRA concerning the end of the transition period" [Doc JCRB-10/9(1)]
- Supplementary Comparisons [Doc JCRB-10/7]
- Proposal to establish Working Groups on CMCs, aimed at facilitating the review process for CMCs as well as ensuring appropriate monitoring of the impact of key comparison results on CMC claims.
- Establishment of a joint BIPM-ILAC Working Group to address issues relating to the coherence between the CIPM and ILAC MRAs. Closer links have been developed with ILAC to ensure that the metrology and accreditation communities are speaking the same language, of critical importance given that one of the drivers in the establishment of the CIPM MRA was the accreditation community's need for confidence in the capabilities claimed by national metrology institutes.

All documents referenced here are listed in the Contents and copies are attached. Taken together, these documents provide a useful *aide-memoire* on the development of the operation of the CIPM MRA during its initial period.

3. Critical issues for the future

During the first four years of its operation, members of the JCRB have noted the tremendous value of MRA activities in increasing confidence and transparency between NMI metrology experts across the globe. The European metrology community is in fact using the published CMCs in the KCDB as a tool for its strategic planning processes, to help identify areas in which European NMIs can develop "regional" centres for delivery of traceability and other forms of intra-regional cooperation. Together with the BIPM, RMO members of the JCRB have begun to raise awareness of the benefits of participation in the MRA among their memberships, and it is anticipated that more members of APMP, COOMET, SADCMET and SIM will sign on to the CIPM MRA in the short-to-medium term.

As Chairman of the JCRB, it is clear from the change in emphasis of the discussions at JCRB meetings that many of the procedural issues relating to the CIPM MRA have now been satisfactorily dealt with. The JCRB can now address more general issues related to the implementation of the MRA. Among the technical issues that still remain, however, are the following:

1. **The importance of inter-regional harmonisation of CMC reviews and the role of the JCRB:** Technical issues in the area of Thermometry, for example, must be resolved to facilitate the publication of CMCs in this area although at the May 2003 meeting of the CCT considerable progress was made in resolving these issues; technical experts must be urged to finalise CMC reviews in Time & Frequency, Chemistry and Ionising Radiation. In some of these areas, submissions are held up to enable CMCs in all sub-areas or from all NMIs to be submitted simultaneously as far as practicable. While I understand the attractiveness of having everything appearing at once, I would discourage this approach as it results in significant delays at the BIPM due to an overload of work in processing enormous submissions.
2. **The importance of inter-regional harmonisation of Quality System reviews and the role of the JCRB**: Again, the JCRB has an important role to play in facilitating mutual recognition between regions of the various processes adopted in the recognition of Quality Systems in support of NMI's measurement capabilities.
3. **The implications of the approaching end of the transitional period of the MRA, on 31 December 2003.** The main issue to be resolved by all RMO members with the approach of the end of the transition period will be whether the evidence for published CMC claims meet the strict criteria coming into effect after that time and, if not, what action is required regarding such CMCs.

Among the broader issues that now need to be addressed by (among others) the JCRB are:

4. **The need to increase awareness among users of the existence and importance of the CIPM MRA and the KCDB**: Efforts to promote the CIPM MRA and KCDB must be increased, particularly towards trade and regulatory agencies and industry. This is an activity in which JCRB members can play a lead role, including encouraging promotion by NMI Directors within their memberships to national representatives within trade/regulatory and industry sectors.
5. **The need to assist participation in the MRA by developing countries**: By the end of 2002, signatories to the CIPM MRA comprised the Directors of NMIs of forty-three Member States of the Metre Convention, two International Organizations, and nine States or Economies that became Associates of the CGPM. At this time, this includes only a few of the small and developing countries. Again, JCRB members – particularly those from the APMP, COOMET, SADCMET and SIM regions – have an important role to play in supporting activities and identifying mechanisms to facilitate participation in the CIPM MRA by developing countries in their regions, and thereby ensure that the CIPM MRA is an effective tool in reducing technical barriers to trade.

It is clear that much work is still required to promote the CIPM MRA to governments and other parties as providing the necessary technically credible underpinning for wider agreements related to international trade, commerce and regulatory affairs.

The major part of putting in place the technical infrastructure of the MRA is accomplished, the results of key comparisons are coming in and a large number of CMCs are in Appendix C of the KCDB. All of this represents the results of a huge effort by staff within the National Metrology Institutes, members of the Technical Committees of the Regional Metrology Organisations and of the CIPM Consultative Committees, and members of the JCRB themselves.

While the JCRB is formally concerned mainly with the CMCs, the key comparisons provide their support. While it is true that the results of key comparisons are now coming into Appendix B of the KCDB, they are coming at a slow pace. The reason for this is that there is now an increasing length of time between the end of the measurements and the completion of the final report for entry into the database. The origin of this seems to be a drift towards excessive rigour in the statistical analysis of the results. This was never intended and serves very little purpose. The number of data points in most key comparisons is so small that the uncertainty in the result of any detailed statistical analysis is large enough to completely cover any fine subtleties that may have been uncovered. I strongly urge pilot laboratories to keep a sense of proportion in such an analysis and remember that ultimately it is their judgement as metrologists that is the most important ingredient in the production of a final report of a comparison. I would like to add that the experience we now have at the BIPM in the analysis and the preparation of final reports is available at any time to pilot laboratories and we are very willing to help in individual cases to accelerate the production of the final report.

It is recognised by all involved that the implementation of the CIPM MRA is very much an activity with no defined end-point, as the nature of metrology is such that capabilities must be re-evaluated on an on-going basis to ensure their validity. However, the work undertaken to date has set the stage for trade negotiators, regulators and the international accreditation community to use the CIPM MRA and its KCDB as the most comprehensive internationally recognised and credible information resource of the technical competence of participating nations to undertake accurate measurements at the peak level. I take this opportunity, on behalf of the members of the JCRB, to congratulate the international metrology community for the enthusiasm, energetic and constructive discussions and outstanding efforts that have taken place to reach this point.

Terry Quinn
Chairman, JCRB &
Director, BIPM.

1 September 2003.

Joint Committee of the Regional metrology Organizations and the BIPM

Summary report of the 1st meeting, held at the BIPM on 21st February 1998.

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Present: Dr Barry Inglis (APMP)
Dr Robert Spurny (COOMET)
Dr Kim Carneiro (EUROMET)
Dr Bruce Foulis (SADCMET)
Dr Hector Nava (SIM)
Dr Ismael Castelazo (SIM, NORAMET)
Dr Stephen Carpenter (SIM)
Prof. Giorgio Moscati (SIM, SURAMET)
Dr Mauricio Frota (SIM, SURAMET)
Dr Bill Blevin (CIPM)
Dr Robert Kaarls (CIPM)
Dr Terry Quinn (BIPM, Chairman)

The main points of business of the first meeting of the Joint Committee (see the Agenda attached) were:

- to establish the membership of the Committee,
- set out draft terms of reference for approval by the CIPM,
- define the responsibilities of the Committee in the draft MRA for national measurement standards and calibration certificates
- to discuss parts of the text of the MRA concerned with calibration certificates issued by national metrology institutes to be proposed to the meeting of directors taking place on 23rd February 1998.

Membership of the Joint Committee

The Committee agreed that the members of the Joint Committee shall be the Regional Metrology Organizations present at this first meeting plus any others properly constituted in the future and approved by the present membership. It was noted that the Regional Metrology Organizations at present existing in the Americas shall be represented by SIM.

The terms of reference of the Joint Committee

The following terms of reference were agreed by the Joint Committee:

The Joint Committee is charged with:

a) coordinating the activities among the RMOs in establishing confidence for the recognition of calibration certificates, according to the terms of the mutual recognition agreement (MRA)
b) making policy suggestions to the RMOs and to the CIPM on the operation of the MRA,
c) reviewing the application by each RMO of the criteria of the MRA,
d) entering into Appendix C the proposals of each RMO in respect of the calibration measurement capabilities of their member NMIs, this entry being provisional pending subsequent ratification by member NMIs of the RMOs, and reporting to the CIPM,
e) arranging appropriate inter-regional supplementary comparisons,
f) facilitating the exchange of experts as provided for in paragraph T.11.2(b) of the MRA,
g) writing an annual report on the activities of the Joint Committee to the CIPM and to the signatories of the MRA.

These terms of reference were approved at the meeting of directors on 23rd February and will be put to the CIPM for approval in September 1998.

Responsibilities of the Joint Committee in the draft MRA

The responsibilities of the Joint Committee in the draft MRA were discussed and various small modifications to the text proposed by the Chairman were made. This was further discussed at the meeting of directors and subsequently; reference should be made to the current version of the MRA.

Text of the MRA concerning calibration certificates

The Joint Committee spent considerable time in discussing the draft text of the MRA concerning calibration certificates. The version approved by the Joint committee was further discussed and modified at the meeting of directors and subsequently in further correspondence with directors. Reference should be made to the latest version of the MRA.

Next meeting of the Joint Committee

The next meeting of the Joint Committee will take place in the Spring of 1999.

T. J. QUINN
Chairman, Joint Committee

BRIEF REPORT ON THE DECISIONS AND CONCLUSIONS OF THE SECOND MEETING OF THE JCRB HELD AT THE BIPM ON 15TH AND 16TH FEBRUARY 1999

Present:	Dr Barry Inglis	APMP
	Dr Hidetaka Imai	APMP
	Prof. Changyan Shi	APMP
	Dr Vladimir I. Belotserkovsky	COOMET
	Dr Alexander Astashenkov	COOMET
	Prof. Lev K. Issaev	COOMET
	Dr Luc Erard	EUROMET
	Dr Andrew J. Wallard	EUROMET
	Dr A. Shenhar	MENAMET
	Prof. Dr Hüseyin Ugur	MENAMET
	Dr Franz Hengstberger	SADCMET
	Dr Alan Robertson	SIM
	Dr Ismael Castelazo	SIM
	Dr Hratch Semerjian	SIM
	Dr W.R. Blevin	CIPM
	Dr Katharine Gebbie	CIPM
	Dr Kozo Iizuka	CIPM
	Dr Robert Kaarls	CIPM
	Dr Terry Quinn	BIPM

Notes on agenda items:

1. OPENING OF THE MEETING AND WELCOME BY THE CHAIRMAN

2. FINAL TEXT OF THE MRA AND GUIDELINES ON KEY COMPARISONS

The text of the MRA was examined in detail and a number of small modifications stemming from comments of directors of NMIs and decisions of the CIPM were noted. The JCRB agreed on some other small modifications to the text to improve clarity. In particular:

- the title of the MRA should be modified with "measurement" replacing "calibration"
- in the text, "calibration" should in general be replaced by "calibration and measurement"
- a note should be added to provide for participation in the agreement by international and intergovernmental organizations
- the designation of key comparisons was modified to make it clear that key comparisons are decided by the Consultative Committees and that key comparisons carried out by the CCs or the BIPM are better called CIPM key comparisons
- the paragraph on participation in CIPM key comparisons was clarified.

There were in addition various other minor editorial modifications. None of these changes are considered significant and do not affect the agreement given by directors to the July 1998 text but they improve its clarity and resolve certain ambiguities.

As regards the Guidelines for key comparisons, an important change was made in paragraph 9 concerning the possibility of withdrawing a result that appears anomalous. The new text will preserve the reputation of the MRA by making it much more difficult for a laboratory to appear to withdraw a poor result. Other minor changes were made to improve clarity.

All of these changes were submitted to the bureau of the CIPM which met on 17th February and were approved. Copies of revised MRA and Guidelines are enclosed. Please note that pending final proof reading these texts should not be distributed outside JCRB members.

3. DRAFT RULES OF PROCEDURE OF THE JCRB

The draft text of rules for procedure of the JCRB proposed by the chairman were discussed. The final agreed version is appended to this report. It was agreed that concerning approval by the local RMO of NMI's proposed calibration measurement capabilities (cmcs) offered under MRA paragraph 7.3(b), there are three main criteria:

1. Results of participation in key and supplementary comparisons
2. The past history of bilateral and multiliateral comparisons
3. The operation of a quality system:
    - the content of the quality system
    - the reports of regular visits by peers from the local RMO as foreseen in paragraph 7.3(b) of the MRA.

In the event that the proposed cmcs from an RMO are challenged at a meeting of the JCRB, the procedures now described under 3.2.2 and 3.2.3 are applied.

4. PROPOSALS FROM RMOS FOR CALIBRATION MEASUREMENT CAPABILITIES FOR INCLUSION IN APPENDIX C OF THE MRA

A broad discussion took place on the way in which proposals for inclusion in Appendix C should be prepared. It was agreed that

(a) I. Castelazo would convene a working group made up of a member from each of the RMOs to draft a format for presenting inclusions to Appendix C for distribution as soon as possible. RMOs to send name of representative to I. Castelazo as soon as possible.

(b) . each RMO will present for the next meeting specific proposals under both paragraphs 7.3(a) and 7.3(b),

(c) each RMO will present its own ideas on the minimum basic criteria for evaluating quality systems to meet paragraph 7.3(b) for distribution before the next meeting.

Items (b) and (c) should be sent to the BIPM by 21 June for distribution.

5. SUPPLEMENTARY COMPARISONS, THEIR IDENTIFICATION AND EXECUTION

It was agreed that supplementary comparisons carried out by the RMO in support of calibration and measurement services and to meet specific regional needs should be entered into the MRA Appendix B in a new section B3. These comparisons must be carried out following the Guidelines for key comparisons. Other supplementary comparisons and pilot studies are not to be entered into the Appendix B3.

In discussing key comparisons, it was agreed that insofar as it is possible, the key comparisons carried out by the RMOs should match those carried out by the CCs and in particular it should be made clear that a key comparison normally refers to the quantity being compared and not to the method of measurement used. In this way a key comparison carried out by a CC can be directly linked to the corresponding key comparison carried out by the RMOs even if in some cases the method used in the RMO key comparisons are much less precise and the uncertainties much larger. As an example, a gauge-block key comparison (denoted by L-K1 for example) should specify the length of the gauge blocks (as in fact was done by the CCL) but not the method of measurement. Thus, the CC gauge block comparison could be carried out by interferometry while the corresponding RMO comparison of gauge blocks of the same length could be carried by mechanical feeler gauges. Despite the uncertainties in the RMO key comparison being perhaps an order of magnitude larger, the link between the laboratories in the RMO and CC key comparison would have been established. In terms of nomenclature, the CC comparison using interferometry could be referred to as CCL-K1a while that in the RMO could be APMP.L-K1b. If different techniques are used all having about the same precision there is no need to distinguish them by a, b etc. Similarly in electricity, a 10V comparison could be denoted by EM-K1. When executed by a CC using Josephson arrays it would be CCEM-K1a and by an RMO using Zener diodes as EUROMET.EMK1b. The same RMO could carry out the comparison using Josephson arrays and then they would be executing the key comparison EUROMET.EMK1a.

6. POSSIBLE TASK OF THE JCRB TO DRAW UP AN APPLICATION GUIDE TO ISO GUIDE 25 FOR NMIS

It was agreed that this is a useful task for the JCRB but that it should be based on generic requirements and not limited to ISO Guide 25. This will be taken up in conjunction with the work already in hand under item 4 above.

7. POSSIBLE TASK OF THE JCRB TO DRAW UP A LIST OF ASSESSORS OF NMIS FOR THIRD PARTY ASSESSMENT.

It was agreed that it is premature to draw up a JCRB list of assessors and that following the discussion under 3 above it is first the responsibility of each RMO to choose appropriate peers to visit NMIs under paragraph 7.3(b).

8. FUTURE OPERATION OF THE JCRB

It was agreed that:

- RMOs should send to Executive Secretaries of the CCs their lists of provisional comparisons for Appendix B six weeks before the meetings of the CCs this year (see dates of CCs attached). A statement from RMO should be included confirming that these past comparisons have been reviewed and found suitable.
- We should try and have real data for Appendices B and C for the beginning of next year, noting that we hope to have the key comparison database operational by November 1999.
- The BIPM is preparing as soon as possible a complete list of current key comparisons for a provisional database on the BIPM web page. *(It would be useful if in due course corresponding lists of RMO comparisons could be provided by RMOs to the BIPM to be added to the BIPM list. TJQuinn).*
- All data for inclusion in database should be in Excel format.
- RMOs to send an updated list of Technical Committee membership to the BIPM for distribution to JCRB.

9. NEXT MEETING

It was agreed that the next meeting will take place in conjunction with the NCSL meeting in Charlotte NC probably on 15th and 16th of July 1999 (date to be confirmed). Papers for this meeting should be sent to BIPM for distribution by 21 June at the latest.

T.J.Quinn
22nd February 1999

Report of the third meeting of the JCRB held on Thursday 15 July 1999 at the Convention Centre Charlotte, North Carolina, USA

Those present:

T. Quinn	BIPM (chairman)
R. Kaarls	CIPM (secretary)
K. Gebbie	CIPM
H. Ugur	MENAMET
S. Carpenter	MENAMET
M. Frota	SIM
A. Robertson	SIM
H. Semerjian	SIM
R. Watters	SIM
Q. L. Mussio	SIM
H. Mitani	SIM
I. Castelazo	SIM
B. Inglis	APMP
H. Imai	APMP
K. Seta	APMP
Lam	APMP
F. Hengstberger	SADCMET
L. Erard	EUROMET
W. Schwitz	EUROMET
A. Wallard	EUROMET

1. After having welcomed the representatives the chairman opened the meeting. The draft agenda was approved while adding point 6.4: provisional data for Appendix C.
   R. Kaarls was asked to act as secretary to the meeting.

2. Dr H. Ugur, the representative from a new region in the Middle East and Northern African area, MENAMET, was warmly welcomed.
   As far as was known discussions were in progress to establish possibly two other regions:
   - BBCC-Met in the Balkan and the near Asia area
   - CIS-Met by the CIS-countries, Russia and Ukraine

1. The report of the second meeting of the JCRB wass approved.

2. The chairman introduced the MRA by giving a brief summary of the development of this document. An earlier draft of the MRA had been initiated by the directors of the NMIs during their meeting on 23 - 25 February 1998. After this meeting further discussions took place, a few changes were made and in April 1999 the printed version was distributed to directors. Since then more comments and requests for modification had been received, in particular from the NIST and the PTB. As a result of very recent discussions some further modifications were now proposed. These do not change the sense of the document and none of them should put in question permission already received by directors from the government or other official authorities in their country to sign the April text.The chairman outlined the proposed changes. These were:
   - to replace “Agreement” by “Arrangement” throughout the whole MRA document (Note: the French foreign ministry has no problems with this change, since they recognize the French word “Arrangement” as well and the important point is the content not the title of the document).
   - to replace “Commitment” by “Engagement”
   - to replace “approving by the JCRB” by “analysing and reviewing by the JCRB”
   - to replace “a suitable quality system” by “a suitable way of assuring quality”.

   Further editorial improvements have simplified and strengthened the text of the MRA.
   Some clarifying notes would be added.

After the initial period of four years the agreement might be modified, if needed, again with the approval of the government or other official authority concerned. In order to be flexible it was left open whether modifications needed to be accepted by unanimous vote or by one or another majority voting.

Where in the "Technical supplement to the agreement" the text was amended to conform with the MRA text.
In paragraph T3 a phrase was added that in exceptional cases it might not be possible to establish a reference value.

The chairman would consider whether in paragraph T7 reference should be made to the fact that in general the uncertainty in calibration and measurement certificates is stated on the basis of k=2, which approximates in general a nominal 95% level of confidence.

In the "Glossary of terms used in this agreement" all the mathematics would be deleted.

The Guidelines for CIPM key comparisons were no longer to be an appendix to the MRA in order to allow flexibility for this technical document to evolve.
The members of the JCRB considered the proposed modifications as acceptable and were of the opinion that the MRA was consistent and clear. The chairman would update the MRA and send it to directors of all NMIs of the Metre Convention, accompanied by a letter explaining why the modifications had been made (copies enclosed with this report).

5. The Rules of Procedure of the JCRB were reviewed. The text in the different paragraphs would be brought into line with the text in the MRA.

It was noted that the text of paragraph 3 "Procedures at a JCRB meeting" might be re-examined in the future when more experience had been gathered with the whole process of reviewing the ways of assuring quality implemented by participating NMIs and their RMOs.

For the time being paragraphs 3.1 and 3.2 would stay as they are, noting that peer-review visits might also be carried out in cases where the NMI had been accredited by an accreditation body, being a signatory to the ILAC-MRA.
(Remark: the ILAC MRA is expected to be signed early in 2000).

6.1 Dr Castelazo introduced the proposals for the format on submission to Appendix C (see Documents JCRB 3/13 and JCRB 3/14)

It was confirmed that the nomenclature used for the RMO key comparisons would follow the nomenclature as used by the CCs for the CIPM key comparisons, but that the RMOs would have their own system of consecutive numbering.
Every comparison would have its own number sequence; the same number would be used again only if the same key comparison were repeated in exactly the same way some years later, although and this was considered unlikely.

Further it was concluded that:

- key comparisons carried out by the BIPM would be re-numbered to avoid duplication with CC key comparisons
- supplementary comparisons would not be coordinated by the BIPM; every region would register its own supplementary comparisons according to the agreed nomenclature
- inter-regional supplementary comparisons would have a unique number; the coordination would be done by the RMOs involved or by the JCRB.

With respect to the format of Appendix C it was agreed that there would be two levels of format:

a) a more extensive format including all the columns as presented in Doc. JCRB 3/12; this document is intended for use within the JCRB and the RMOs; it can however be shown to authorities who are interested, for example the traceability routes.
b) A simplified version only having the columns:
    - Calibration or measurement service
    - Measurand level or range
    - Independent variable

- Expanded uncertainty

This simplified version would be published as Annex C and would be publicly accessible via the Web. The claimed best calibration and measurement capabilities would be subdivided in sub-measurement ranges in such a way that the claimed CMC is applicable over the whole sub-range. It was also possible to state an uncertainty range which increased linearly up with quoted sub-measurement range. In other cases it may be possible to state the uncertainty in the form of a formula. Also special calibration and measurement points could be stated with their specific uncertainties.

Dr Castelazo in cooperation with Dr Watters would adapt the formats taking into account the results of the discussion and the remarks and suggestions received from the RMOs. Also the names of the headings would be reconsidered, avoiding misunderstandings as traceability to an NMI instead of to the SI.

The definitive format would be sent to the RMOs before the end of July 1999. This format would be used for all fields of metrology with the exception of the chemical field. The RMOs woulddistribute the format to their member NMIs.

6.2 The proposals of the RMOs would be taken into account as indicated in 6.11. Separate sheets should be used for each subject field. It was agreed that the database would be in the English language.

The database would be maintained for the first years jointly by the NIST and the BIPM, after which it wouldbe held and maintained on a permanent basis by the BIPM.

The NMIs were free to produce hard copies of Appendix C translated in their own language. The costs of this would be assumed by the NMIs themselves.

Dr Semerjian introduced a special format for Appendix C to be used for calibration and measurement services in the chemical field. Since metrology in chemistry was new, it was decided that Dr Semerjian would adapt the draft format, taking into account the discussion with respect to the format in the physical field, and then send it out for consideration by the RMOs and the CCQM. Comments would have to be returned to Dr Semerjian before mid-September 1999.

6.3 The RMOs presented their process and criteria for the evaluation of the different quality systems or ways of assuring quality used by their member NMIs.

It was clear that in particular for the case of long-standing RMOs a great deal of information was already known about each other's quality systems as implemented by the different member NMIs. Nevertheless, the RMOs made clear that they would like the opportunity to consider some of the aspects of the application in more detail.

Three documents were presented, from Euromet (JCRB 3/1), APMP document (JCRB 3/6) and SIM (JCRB 3/7). A general discussion took place on these three documents and it was concluded that a good level of agreement existed between the procedure envisaged by the three RMOs. The JCRB invited the three RMOs to finalize their documents in consultation with each other with a view to presenting final versions at the next meeting.

The JCRB recommended that peers from other regions attend assessment review meetings of the RMOs.

The other regions were also invited to present their proposals at the next meeting of the JCRB.

6.4 The chairman then proposed that a set of provisional data for Appendix C be prepared as soon as possible. These provisional data would be based on existing results of comparisons and other available knowledge and experience.

The JCRB agreed that available provisional data should be sent by the RMOs to the BIPM before 31 December 1999. This should be done either in electronic form or in paper format . According to the rules of procedure of the JCRB the BIPM will send the gathered information in electronic form to the RMOs for comment.
At a meeting of the JCRB on 20 - 21 March 2000 the provisional data would be analysed and reviewed by the JCRB for inclusion in Appendix C.
It should then be possible to have the first Appendix C data available on the Web in the Summer of 2000.

7. The list of key and supplementary comparisons as updated by the BIPM is now available at the BIPM and on the Web.

8. Dr Watters informed the JCRB about the latest phase of development of the BIPM database.
The JCRB expressed its greatest appreciation for the enormous amount of work done by the NIST and Dr Watters in creating the database.

9. No other business was left open.

10. The next meeting of the JCRB will be held, in connection with the PittCon conference in the USA (12 - 17 March 2000), at NIST - Gaithersburg on 20 and 21 March 2000.

Dr Carpenter would confirm these dates with Dr Quinn.

Dr Quinn closed the meeting and thanked everyone for their contribution.

Third meeting of the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB)

List of Documents

JCRB3/1	EUROMET PROJECT 512 - DRAFT FINAL REPORT Title: Implementation of the BIPM's MRA for EUROMET member countries
JCRB3/2	The COOMET activity in the period between its meetings and tasks relating to increase of cooperation effectiveness
JCRB3/3	SADCMET 1) Uncorrected minutes of the third meeting of the SADCMET Committee 2) NML, CSIR (South Africa): Proposed Schedule of accreditation
JCRB3/4	NORAMET: 1) Mass mutual recognition agreements. 2) Appendix C Format for the CIPM MRA - NORAMETproposal
JCRB3/5	Establishment of MENAMET
JCRB3/6	APMP: Minimum Requirements for Evaluating Quality Systems of NMIs
JCRB3/7	SIM: Proposal for minimum basic criteria to meet requirements of paragraph 7.3(b) of the CIPM MRA
JCRB3/8	EUROMET: NPL example for Annex C
JCRB3/9	EUROMET: PTB example for Annex C
JCRB3/10	EUROMET: DFM example for Annex C
JCRB3/11	NIST: Proposed draft format for chemical metrology declarations
JCRB3/12	NIST: Relationships and lay-out database
JCRB3/13	SIM: Appendix C format for the CIPM MRA
JCRB3/14	SIM: Proposal for Nomenclature of SIM comparisons

Report on the fourth meeting of the JCRB held on
20 - 21 March 2000
at NIST, Gaithersburg, Md - USA

Those present:

T. Quinn	BIPM (chairman)
R. Kaarls	CIPM (secretary)
K. Brown	CIPM
D. Vasiliev	COOMET
V. Belotserkovsky	COOMET
A. Robertson	SIM
I. Castelazo	SIM
H. Semerjian	SIM
L. Contier de Freitas	SIM
J. Lusztyk	SIM
S. Carpenter	SIM
B. Inglis	APMP
H. Imai	APMP
N.H. Van	APMP
K.H. Lam	APMP
S.W. Chua	APMP
C. Shi	APMP
L. Erard	EUROMET
A. Wallard	EUROMET
W. Schwitz	EUROMET
F. Hengstberger	SADCMET
H. Ugur	MENAMET

Invited:

C. Thomas	BIPM
R. Watters	NIST

The list of participants with their affiliation with their e-mail addresses is added as Annex 1 to these minutes.

1. The chairman opened the meeting welcoming the representatives of the RMOs and their advisors as well as Dr Robert Watters and Dr Claudine Thomas invited to present their work on the database.. The draft agenda was approved with the addition of a point on the role of the CC's under agenda point 7. Other business.

   Dr Kaarls agreed to act as secretary to the meeting.
   The chairman then summarised the enormous progress in the development of the MRA since the last meeting of the JCRB on 15 July 1999 at Charlotte, NC, USA.
   In October 1999 the MRA was signed by the Directors of the NMI's, the databases for appendices B and C have been developed much further, the RMO's have done much work in delivering draft input data and the CC's have advanced considerably in the identification and execution of key comparisons. The draft data files for Appendix C received by the BIPM are available now on CD. These CD's will be distributed to the RMO's / NMI's concerned; the data on the CD's are only for internal RMO/NMI consideration and are not intended for public use.

   With the agreement of the Committee, the chairman then asked Dr Thomas to make a presentation on the present state of the databases. See Appendix 2 to this report.

2. The report of the third meeting of the JCRB was approved, with the remark that the format for Appendix C of the MRA for measurement capabilities in Amount of Substance will be discussed and approved later; the CCQM will have a final discussion on this format during its meeting on 6-7 April this year.

3. The Rules of Procedure for the JCRB have undergone minor modifications in order to take into account changes in the MRA made between February and October 1999. With the signing of the MRA in October 1999 these Rules of Procedure were approved.

4. The provisional data files submitted by RMOs for Appendix C of the MRA triggered an extensive discussion.
   The chairman reminded the members of the JCRB of his letter of 24 November 1999, written after he had attended a meeting of the APMP. It was understood that the provisional data for Appendix C would be judged on the basis of the elements mentioned in this letter of 24 November 1999. (See Appendix 3).
   The chairman invited the RMO's to clarify the procedures they have used so far and explain the problems they might have encountered and the possible solutions to the problems. The representatives of the RMO's tabled a number of documents, annexed as Appendices 4 to 7 to this report.

   After ample discussions the JCRB agreed on the following statement:

   The JCRB at its 4th meeting on 20 an 21 March 2000 is of the unanimous opinion that the declared objectives of the MRA require the CMC data entered in Appendix C be declared fully reliable by the RMO's. In consequence, CMC files submitted by NMI's will remain in the review and analysis loops of the RMO's and the JCRB until such time as this is the case.

   Further with respect to the provisional data for Appendix C the JCRB agreed that:
   - since only data declared fully reliable will be published in Appendix C, which is the database accessible by the outside world, there will be no "flags" or comments in the data in this database; in the draft data files reviewed by the RMOs and JCRB, however, flags or comments may be inserted;
   - during the transitional period, the CMC's will be reviewed on the basis of the notes sent around by Dr Quinn in his letter of 24 November 1999 supplemented by the more detailed notes adopted by each RMO and given as Appendices 4 to 7 here;
   - in first instance, the CMC data, after it has been sent in by an RMO, will be made available by the BIPM to all the other RMO's via CD's; these data files are not intended to be open to the public and should only be considered by the RMO's in order to be able to form an opinion about the acceptability for the inclusion in Appendix C of the MRA;
   - each RMO will itself select which CMC from another RMO and in what detail it will be reviewed, since it is impossible to check every data file from every other RMO;
   - the chairs of the different working groups of the RMO's co-ordinate and exchange their opinions on the CMC's directly to each other through the chairmen of the RMO's, this exchange will be done by e-mail, while an e-mail copy also will be sent to the chairman of the JCRB;
   - the RMO's will either give comments or will confirm that they have no comment;
   - for the data files already sent in, the RMO's will forward their revisions and any additional data before 31 May 2000; also the RMO's should give the status of the data (OK, under review, etc.)
   - if in a region not enough expertise is available to review and analyse a CMC of an NMI, the region or NMI concerned will ask another region to provide the required expertise and assistance in the review and analysing process.
   - the CC-Working Groups on Key-Comparisons will be asked to provide for all fields a harmonised classification of "services" (if possible) before 30 June 2000 to the BIPM. Dr Quinn will inform the CC-chairs and working group chairs on this issue (e-mails sent 30 March 2000).

   The JCRB agreed on the following time schedule, while setting priorities for those areas of measurements which are mostly developed now with respect to the review and analysis of CMC's:

   - Deadline for submission of revised data files (in particular length, electricity and magnetism) **31 May 2000**
   - Final date for receiving comments from the RMO's **31 August 2000**
   - Review and preparation for Appendix C by JCRB **11-13 October 2000**

- First publication Appendix C **December 2000**

- Deadline for submission of revised data **31 October 2000**
  (in particular AUV, T, PR, IR, gas mixtures, mass standards, force and pressure)
- Final date for receiving comments from the RMO's **31 January 2001**
- Review and preparation for Appendix C by JCRB **12-13 March 2001**
- Publication in Appendix C **May 2001**

- Deadline for submission of revised data **31 May 2001**
  (in particular rest of mass and some chemistry)
- Final date for receiving comments from the RMO's **31 August 2001**
- Review and preparation for Appendix C by JCRB **8-9 October 2001**
- Publication in Appendix C **December 2001**

It is planned that the JCRB will meet every six months for the foreseeable future and that the above scheme of dates and deadlines will continue from year to year. The scheme does not exclude the possibility of CMC data files becoming available earlier being discussed.

Please note that all data files should be sent directly to Claudine Thomas at the BIPM on cthomas@bipm.fr, do not use other e-mail addresses at the BIPM. This is to ensure the minimum of internal BIPM manipulation of the data files.

With respect to a few other points related to Appendix C the JCRB decided that:
- Bob Watters and Claudine Thomas will complete several changes with respect to the input data files to be delivered by the RMO's and will distribute new instructions as soon as possible to the RMO's (Appendix 9).
- in Appendix C, an extra column will be added for stating k (in general k=2)
- in Appendix C contact persons will not be mentioned but only the NMI concerned and its co-ordinates.
- instead of ISO/IEC Guide 25, from now on one will read ISO /IEC Standard 17025.
- the model 2 of Appendix 8 to this report will be used as the format for Appendix C in the field of measurement capabilities in chemistry, pending a final discussion by the CCQM during its meeting on 6-7 April 2000.
- as soon as the JCRB has agreed on all RMO review procedures the JCRB will produce a compilation of all these procedures;
- the chairs of the relevant CC Key Comparisons Working Groups must be informed of RMO Key Comparisons and RMO Supplementary Comparisons and through them the results will be included in the key comparison database

5. No provisional data for Appendix C was discussed during this meeting of the JCRB since further clarification of the status of the data is needed and several data may have to be revised or added. All clarification and submission of revised or added data shall be sent in before 31 May 2000 (see timetable above).

   Before the submitted data files are approved for inclusion in Appendix C the data files will be distributed by the BIPM to the RMOs on CD's; this will also make it possible to carry out a check on the correctness of the data.

6. The Key Comparison database including a full list and details of all key comparisons (Appendix B of the MRA but with as yet no results) opened on the web on 30 November 1999.

   As regards key comparison reference values, In principle should always be a Key Comparison Reference Value connected to a Key Comparison. This rule is applicable to all the fields of measurements and only in exceptional cases for technical reasons a CC may decide that it is not appropriate to have a Key Comparison Reference Value.

   Although it may be possible and desirable to have a direct link between Appendix C and Appendix B in order to see which Key Comparison is underpinning a claimed CMC, it would not be wise to make this information directly publicly accessible, since there will be several CMC's which are not

directly underpinned by a Key Comparison but have nevertheless been approved on the basis of other considerations (peer review results, accreditation, etc.)

With respect to the search possibilities in the database, we must take into account the needs of the users. For example, a user may like to know to what extend one can rely on the calibration and measurement certificates issued by an NMI in a certain country for a particular quantity.

The chairman of the JCRB concludes the discussions on the databases with special thanks for the enormous efforts made by Bob Watters and Claudine Thomas and several other members of the staff of NIST and BIPM, his remarks were applauded by all members.

7. With respect to the role of the CC's in relation to the Appendix C it is concluded that the CC's will not have a direct role but that their key comparison working groups provide about the only worldwide forum for discussing matters such as formats and unified lists of measurement services. In the case that inconsistencies between the RMO's cannot easily be solved by the RMO's, the chair of the JCRB may consult the CC for advice.

8. The next meeting of the JCRB will be on 11 – 13 October 2000 at the BIPM in Sèvres.

   During this meeting not only the first CMC's will be reviewed but also the different review procedures and criteria used by the different RMO's (the quality issues, etc.) will be discussed.

   The chairman adjourns the meeting and thanks everyone for their contributions in the meeting and the NIST for the provision of facilities.

List of Annexes

1. List of participants and e-mail addresses
2. Presentation of Appendix C files by Claudine Thomas
3. Letter of Dr T. Quinn of 24 November 1999
4. APMP Position Paper on the Entry to Appendix C of the Global MRA
5. APMP Questionnaire for their TC Members
6. EUROMET Contribution to the JCRB No. 4
7. SIM Procedure for Review of Calibration and Measurement Capabilities Submitted for Appendix C of the CIPM-MRA
8. Model 2: format for Appendix C in the field of chemistry
9. List of new instructions with respect to input data for the database.

Document JCRB-5/4

Report on the fifth meeting of the JCRB held on 11-13 October 2000 at the BIPM

Those present:

T. J. Quinn	BIPM (chairman)
R. Kaarls	CIPM (secretary)
B. Inglis (representing H. Imae, JCRB representative)	APMP
K. Seta	APMP
Shi Changyan	APMP
V. Belotserkovsky (JCRB representative)	COOMET
P. Kneppo	COOMET
A. Pokhodun	COOMET
W. Schwitz (JCRB representative)	EUROMET
A. Wallard	EUROMET
L. Erard	EUROMET
H. Ugur (JCRB representative)	MENAMET
F. Hengstberger (JCRB representative)	SADCMET
F. Denner	SADCMET
I. Castelazo (JCRB representative)	SIM
H. Semerjian	SIM
C. Thomas (BIPM key comparison database)	BIPM
R. Watters (NIST international comparison database)	NIST

The draft agenda, document JCRB-5/0, and list of participants with their affiliation and co-ordinates are added as Annexes 1 and 2 to this report. The report follows the order of the agenda.

1. Opening and welcome by the Chairman

The chairman opened the meeting welcoming the representatives of the RMOs as well as Dr Claudine Thomas and Dr Robert Watters. The draft agenda was approved with the addition of a discussion on "rejection criteria" under point 5.2 and adding an agenda point 8a: discussion on Quality Systems. Dr Kaarls agreed to act as secretary to the meeting.

2. Matters arising from the report of the fourth meeting of the JCRB held at NIST in March 2000

The Report on the 4th meeting of the JCRB was approved.
With reference to this report the chairman mentioned the following points:

- Most of the agreed actions have been carried out;
- The CMC database has been developed further and is now nearly ready for implementation;
- The BIPM key comparison database, produced in collaboration with the NIST, has developed faster than expected and it is now clear that it can be maintained and further developed as necessary by the BIPM; it is already, *de facto*, decoupled from the NIST database which is increasingly being oriented more closely to the needs of SIM and the USA;
- A compilation of all procedures for the preparation and review of CMCs, including the internal RMO procedures is not yet ready; this will be done as soon as the definitive procedures of all the RMOs have been received.

Various other points arising from the report of the 4th meeting were left to be discussed later as they were on the agenda of the 5th meeting of the JCRB.

3. Report by the Chairman on progress since the March meeting:

- For the proper functioning of the JCRB, everyone is reminded on the content of Appendix E of the MRA describing the Terms of Reference of the JCRB;
- First results of key comparisons can now be found in the Appendix B; it includes the results of the CCQM key comparisons on gas mixtures, which have thoroughly been discussed, before they were put into Appendix B;

- Experience has shown that it is essential for two or three persons of the CC Working Group concerned with each key comparison go through the results in depth in order to avoid errors as much as possible; the pilot laboratory has to examine the results very carefully;
- The final presentation in Appendix B is decided by the chairman of the CC Key Comparison Working Group concerned and by the chairman of that CC;
- Some 300 key comparisons are now underway; these include also RMO key comparisons;
- With respect to Appendix C, several regional co-ordinators have now had meetings with each other; in particular they have discussed the harmonized list of Calibration Measurement Service Categories and Category Numbers;
- Lists of services in the following fields are now ready or nearly ready:
  - length
  - electricity and magnetism
  - ionizing radiation
  - chemistry (first agreement of draft document)
  - photometry (almost ready)
  - acoustics and vibration (well underway).

  Once the list of services is fixed it should not be modified unless it is really necessary, as changes lead to a large amount of additional work for the NMIs;
- A harmonized inter-regional review process is very important; we now have seen two different ways of carrying out this review between the Length and the E&M areas, we must take care that procedures are compatible between different areas;
- In preparing the submitted data for input to Appendix C, the BIPM database coordinator, Dr Claudine Thomas, is faced with very different ways and sometimes incorrect ways of presenting uncertainty claims; harmonization is needed and a paper will be presented later during this meeting;
- A CD was distributed with the most recent CMC data on it, included were the documents received from the different regions for this meeting of the JCRB; the contents list of this CD is annexed to this report, see Annex 2.

4. Reports by RMO representatives to the JCRB

The representatives of the RMOs to the JCRB reported on the progress made in their regions; they also mentioned difficulties faced and questions which arose during the review processes:

APMP

- APMP created a co-ordinating committee in order to be able to harmonize procedures of the different RMO technical working groups.
- A clearer procedure is needed with respect to the inter-regional review process. An easy, direct and flexible contact between the experts of the different regions is needed. However, the RMO management needs to know what is going on: who decides on what and when. It is also essential that the RMO representatives in the JCRB are fully informed on what is going on.

COOMET

- COOMET has now 12 member countries;
- COOMET is also concerned with legal metrology and accreditation;
- Slovakia, being a member of COOMET and EUROMET send its files in via EUROMET;
- So far, COOMET has not sent in any files that have fully passed the intra-regional review, but the files on CMCs in the field of electricity are almost ready and can be expected by the end of the year;
- VNIIM has problems with formulating the CMC file for thermometry since the harmonized service category list is not yet ready (action is with Dr Ono of NRLM, Japan).

The JCRB decided that the COOMET CMCs for electricity and length should be dealt with at the next meeting of the JCRB in March 2001; so COOMET is advised to follow the time schedule set for submission of data for that meeting (See document JCRB-5/3, attached as Annex 5).

EUROMET

- EUROMET counts 25 CIPM-MRA signatories among its members, representing some 80 institutes.
- EUROMET has adapted its procedures a little bit, in particular with respect to the chemical area, since several NMIs do not have their own chemical laboratory.
- So far EUROMET has listed about 11600 lines for entry into the Appendix C.

- EUROMET has noted that in the length area an extensive discussion has started on the procedures, while in the electrical area the emphasis has been on the examination of the submitted data for entry into Appendix C. A more harmonized approach is desirable, as well as criteria for the inter-regional examination of the CMC claims from the other regions.
- Taking into account the workload, a full examination of all the claims of another region is not realistic.
- EUROMET is not in favour of applying statistics when reviewing CMCs.
- The assessment of the quality systems of the NMIs has been planned now and will receive support from the European Commission under a special project "Initiation".

MENAMET

- MENAMET is still in a phase of development and not yet really operational;
- So far, the only country in the MENAMET region to have submitted CMCs (Turkey) has done so through EUROMET.

SADCMET

- SADCMET has now 3 associate members, namely Egypt, Kenya and Uganda.
- It is expected that several countries/economies in Africa will soon apply to become Associates of the CGPM;
- SADCMET CMCs have been reviewed by a regional task group and in addition by NML (Australia), NIST (USA) and NPL (UK).

SIM

- Only 6 NMIs from 6 countries are really participating in the CIPM-MRA.
- Two NMIs will have their quality systems accredited on the basis of ISO 17025; three NMIs will have a quality system in accordance with 17025 open for a peer evaluation and one NMI (NIST) will have a quality system comparable to ISO 17025. At NIST each Laboratory director will look after the way of evaluation of the quality system;
- During the SIM review of submitted CMCs no difficulties arose with respect to the best claims which were underpinned by the results of key and other comparisons. The question is, however, how far does the light shine. More guidance for the working group rapporteurs is needed.

5. Procedures for review and analysis of CMCs

On the basis of the reports by the regions several general procedures were discussed and the following conclusions were drawn:

The Chairman of the JCRB will write a letter to all the NMI directors asking for a clear statement about which single RMO is handling all their CMC-claims.
It is noted that implicitly the NMI should also actively participate in all the projects carried out by that region, since peers have to know each other and their facilities very well as part of the overall review process.
The JCRB decides to create a more detailed procedure, including all steps in the review process while making clear who is responsible for the different actions in the process. This is document JCRB-5/1 given in Annex 3 to this report.

The JCRB also decides to create a separate document with clear deadlines related to the steps in the inter-regional review process, this is document JCRB-5/3, given in Annex 5.

The JCRB is not in favour of giving special names (such as JCRL) to inter-regional groups of experts.

The JCRB re-stated its opinion on the meaning of the phrase in T.7 of the Technical supplement to the MRA: "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". The JCRB recommends that this sentence means simply what it says, that the CMCs should contain the capabilities of an NMI that are normally offered to their customers and which in general are published in the catalog of facilities of the NMI. So, one should not claim capabilities that may be offered under exceptional, time consuming and extra-ordinary expensive circumstances. The term "highest level of calibration" given in the glossary should not be taken to mean anything other than the highest level of calibration normally available to the customer (as in T.7).

5.1 Procedures within the RMOs

The procedures for review and analysis of CMCs within the different RMOs have been considered.

5.2 Harmonization of procedures between RMOs

The RMO review procedures do not necessarily have to be identical, but the principal criteria as formulated by T.J. Quinn in his letter of 24 November 1999 and adapted during this meeting of the JCRB (October 2000) have to be met. See document JCRB-5/1 in Annex 3.

All RMO documents related to review procedures should be publicly available so that the whole system is transparent and open. Each one should have a statement from the RMO saying that the document is complete and is compatible with other RMO documents.

When the RMO documents are all ready, they will be sent to the chairman of the JCRB and be published in one JCRB-document.

It is understood that inter-regional review does not mean that all the submitted CMCs of another region will be reviewed again. It is recommended that a small, carefully chosen, sample of the most critical CMCs from other RMOs should be reviewed and an overall decision be based on the results of this review. See also under point 5.3.

The RMOs may agree among themselves on how to divide the review process under the different RMOs.

Rejection of CMC claims is not a matter of applying statistical rejection criteria, but of good metrological common sense and mutual discussions between the regions concerned.

Unresolved problems should be brought to the attention of the JCRB and will be discussed by the JCRB.

No statistics will be applied in drawing final conclusions on the reliability and acceptability of the total of submitted CMCs;

5.3 Analysis of CMCs from other RMOs, results of meetings of experts in length, electricity and ionizing radiation held in September 2000:

Experiences so far in the areas of length and electricity demonstrate that more guidance is needed in carrying out inter-regional review.
Therefore the existing procedure is expanded and more explanation is added (see JCRB-5/1 and 2, in Annexes 3 and 4).

6. CMCs in length and electricity, present status for entry into Appendix C

The JCRB first of all congratulated all those who had been involved in the immense task of putting together the set of CMCs now nearly ready for entry into Appendix C.

The CMCs in length and electricity were discussed and approved for entry into Appendix C following the timetable of final examinations agreed. It is intended that they appear in the BIPM key comparison database in December for Length and January for electricity.

7. CMCs in other areas

In looking more closely at the proposed lists, the JCRB emphasised again that as a matter of principle there should not be a separate category of so-called "top services". As far as possible all services should be considered together because the key comparisons do not give credibility just to those services directly linked to key comparisons. The JCRB recognised that in the beginning it may be necessary to review only a selection of services but this should not be established as a principle. See document JCRB-5/2 in Annex 4.

The term “top-level-services” should not be introduced.

The time schedule for submission of comments is slightly adapted and agreed. See document JCRB-5/3 in the Annex 5.

7.1 List of services

(see item 3)

7.2 Present status of CMCs

It is expected that the CMCs of the different fields will be submitted according to the time schedule annexed to the report of this meeting. See JCRB-5/3 in Annex 5. For Time and Frequency, Flow and Thermometry no dates have yet been set.

The JCRB noted that there is a need for further discussion to decide for some fields which part of the Appendix C is open to public access.
In the field of ionizing radiation the source of traceability should be visible to the public because it is of importance for the so-called secondary standards laboratories.

7.3 Format for chemistry CMCs

The format for chemistry CMCs has been agreed by the CCQM and subsequently by the JCRB. A list of services in the field of chemistry has been produced but needs final agreement by the CCQM.

8. Future timetable for CMC approval for Appendix C

The existing timetable for CMC approval was discussed and modified. It is given in JCRB-5/3 in Annex 5.
In order to improve the mutual communication between the Technical Committee chairs of the different regions the chairman of the JCRB will compose a list of all TC chairs of the regions.
The RMO representatives to the JCRB are, therefore, asked to provide Dr Quinn before 15 November 2000 with the names, addresses, telephone, fax numbers and e-mail addresses of the persons concerned.

8a. Discussion on quality systems

The evaluation of the quality systems of the NMIs was explained and discussed again by members of the JCRB. In several regions, accreditation is more or less required, or at least strongly recommended.
In the case that accreditation is not applied, a peer evaluation will take place. It is expected that this process will be completed in 2002.
It was decided that at a future meeting of the JCRB the RMOs will explain the procedures they apply for a continuous monitoring of the quality systems of their NMIs.

9. The BIPM key comparison database

Dr Claudine Thomas made a presentation of the BIPM key comparison database. She proposed a design for Appendix C that was discussed and various modifications suggested. These will be implemented. The JCRB asked that the CMCs be presented by country and not by NMI; also that the options be presented of viewing the whole of a country's CMCs for a particular field or an individual CMC chosen from a menu.

9.1. Present situation

A document was presented from Dr Thomas and Dr Quinn giving guidance for the format for stating measurement uncertainty in CMCs. Harmonization is necessary in order to avoid misinterpretation of the statements by the users of the database. The content of this document (given as Annex 6) was generally approved by the JCRB.

9.2. Developments underway

As proposed, an extra column will be introduced indicating whether the stated uncertainty is a relative uncertainty or not.
Also, the lay-out for CMC claims such as AC/DC measurements is explained and agreed on the basis of the proposal mentioned in the annexed document. See Annex 6.

10. Chairman's Report to the CIPM

Dr Quinn will orally report to the CIPM on the results of this meeting of the JCRB, at the meeting of the CIPM to take place on 19-20 October 2000. The report of the meeting of the JCRB will be sent to the CIPM afterwards.

11. Other business

The following points were discussed and agreed:

- Traceability of an NMI's standards to those of an other country is acceptable, assuming that the CMCs of that other NMI are recognised under the CIPM-MRA. This has to be verified during the review process.
- Traceability to an accredited laboratory in or outside one's own country is acceptable provided that this accredited laboratory is recognised under the ILAC-MLA. The traceability of the accredited laboratory has to be obtained from an NMI that is recognised under the CIPM-MRA. The whole traceability chain has to be verified as part of the review process.
- Dr Kaarls will discuss the coordination of references to the CIPM-MRA in ILAC documents, particularly the ILAC-MLA, during the General Assembly meeting of ILAC to be held in the week of 30 October 2000 in Arlington, VA, USA.
- It is recognised that in several countries a decentralised NMI exists. Traceability is therefore acceptable to laboratories officially designated by the NMI concerned or by the government of the country concerned and which form part of that distributed NMI and are designated to realize and maintain national measurement standards and capabilities for certain defined quantities and measurement ranges.
- It is suggested that the Working Group reviewing the Guide on Measurement Uncertainty (GUM) considers the possibility of adding a chapter on the calculation of uncertainty in the key comparison reference value. Dr Quinn will discuss this proposal with the Working Group (Note: at the meeting of the Working Group held at the BIPM in November 2000, the Group decided this was a detailed technical point that did not raise any principles that needed the action of the Working Group and thus the proposal was declined).
- In order to build up mutual confidence between the regions it is agreed that a representative of each region will be invited to attend the meeting of the General Assembly of the other RMOs or the other RMO Technical Committees dealing with the CIPM-MRA issues. The RMOs are asked to inform the chairman of the JCRB on the dates and places of the next meeting of their General Assemblies and other relevant Committee meetings as well as on the persons to contact. Dr Quinn will then distribute the list of meetings to the members of the JCRB.
- Again it is made clear that not all the CMC claims can be underpinned by the results of key comparisons. If doubts exists, however, every RMO may organise supplementary comparisons.
- With respect to entering details and results of RMO key and supplementary comparisons into the BIPM database, Dr Quinn refers to his letter of 8 June 2000 to the chairmen of the RMOs.
- All formal JCRB documents will be numbered as : JCRB-x/y in which x is the nth meeting of the JCRB and y is a serial number;
- The members of the JCRB expressed their great appreciation for the enormous amount of work carried out by Dr Thomas and supporting staff of the BIPM. Also Dr Watters and supporting NIST staff are acknowledged for their tremendous support to the development of the BIPM database.

Note: The Chairman has drawn up a list of archival JCRB which is given below in Annex 7.

12. The next meeting of the JCRB will be held on 8-9 March 2001 at NIST, Gaithersburg, Maryland., USA.

Annexes

1. List of participants with their affiliation and co-ordinates
2. List with the content of the CD distributed at the 5th JCRB
3. JCRB Rules of Procedure for CMC entry into Appendix C, October 2000, designated document JCRB-5/1
4. JCRB Statement on CMC evaluation, 13 October 2000, designated document JCRB-5/2
5. Timetable for submission of CMCs to the JCRB for entry into Appendix C, 13 October 2000, designated document JCRB-5/3
6. Expression of uncertainties in the Calibration and Measurement Capabilities (CMCs) declarations of National Metrology Institutes, note for discussion by T.J. Quinn and C. Thomas, 10 October 2000
7. List of archival documents of the JCRB.

Document JCRB-6/12

Report of the sixth meeting of the JCRB
held on 8-9 March 2001 at the NIST, Gaithersburg

Participants:

T.J. Quinn	BIPM (chairman)
R. Kaarls	CIPM (secretary)
H. Imai	APMP
K. Seta	APMP
B. Inglis	APMP
Shi Changyan	APMP
Sze Wey Chua	APMP
P. Kneppo	COOMET
A. Astashenkov	COOMET
A.I. Pokhodun	COOMET
L. Issaev	COOMET
W. Schwitz	EUROMET
A. Wallard	EUROMET
L. Erard	EUROMET
T.M. Plantenga	EUROMET
H. Ugur	MENAMET
F. Hengstberger	SADCMET
L. F. Urresta	SIM
H. Nava-Jaimes	SIM
I. Castelazo	SIM
H. Semerjian	SIM
J. Lusztyk	SIM
L. Contier de Freitas	SIM
R. DaCosta	SIM
C. Thomas	BIPM
S. Carpenter	NIST

A list of the participants with their affiliation and addresses is added as Appendix 1 to this Report.

1. Opening and welcome by the Chairman

The chairman, Dr T. Quinn (subsequently referred to here as TJQ) opened the meeting welcoming the representatives of the RMOs as well as Dr Claudine Thomas (BIPM).
The draft agenda was approved with the addition of an agenda item 15 "Other business". Under this item the following topics were placed:

- a common text to be printed on calibration certificates issued by NMIs, declaring that the certificate is issued under the provisions of the CIPM MRA;
- supplementary and bilateral comparisons;
- a list of NMI-expert assessors on behalf of ILAC for NMI assessments;
- publicity for the BIPM key comparison database;
- dates and places of next meetings of the JCRB.

2. Matters arising from the report of the fifth meeting of the JCRB held at the BIPM, Sèvres on 11-13 October 2000.

The Report of the fifth meeting of the JCRB was approved. The agreed actions have been carried out or come back under the different points of the agenda for this meeting.

3. Report by the Chairman on progress since the 5th meeting.

The chairman reported on the following issues:

- At the end of 2001 the chairman of the JCRB will write his annual report to the CIPM; a copy will be sent to all JCRB members.
- The implementation of the CIPM MRA proceeds well; much work has been carried out by the NMIs, the RMOs and the BIPM.
- It is now clear that the technical staff acting on behalf of the RMOs involved in the implementation of the MRA should really be "top-people" with sufficient authority and available time; a great deal depends on their efficiency and hard work.
- Co-ordination between RMOs is essential; it is also necessary to maintain frequent links between the RMO technical contact persons and the CC-Key comparison working groups; with its new facilities, the BIPM welcomes such meeting to take place there.
- After having received the CMC claims of the NMIs from their respective RMOs, T.J. Quinn sends the CMC claims to the other RMOs for review; he explained that thereafter it is not clear to him or to RMO representatives which RMO is examining which CMC and what action is being taken; he says that feedback is very desirable in order to be able to follow the process.
- Length and Electricity is now on the web; Claudine Thomas spent much time on the lay-out and harmonization of the CMCs.
- It is TJQ's intention to create a confidential section on the BIPM web page for RMO representatives to the JCRB.

4. Reports by RMO representatives to the JCRB.

APMP
- APMP has established a special committee for assistance to developing economies in the APMP area.
- The next General Assembly of APMP will be held on 7-8 November 2001 at Tsukuba, Japan.
- See also Doc. JCRB-6/04 and Doc. JCRB-6/10.

COOMET
- Only 5 COOMET member-countries have signed the CIPM MRA; the rest of COOMET members have not yet signed.
- Some of the COOMET members are also member of EUROMET and have sent their CMCs via EUROMET.
- The process in COOMET is not very fast; time schedules of meetings have been sent out.
- See also Doc.JCRB-6/01.

EUROMET
- The next meeting of the EUROMET Committee will be on 15-16 May 2001 at Bern, Switzerland.
- The EUROMET web page has now been transferred to Switzerland.
- The process of reviewing CMCs goes very smoothly, but it is a very heavy burden; several thousands of entries have now been reviewed; with exception of ionizing radiation everything is on time.
- EUROMET intends to discuss how to maintain confidence over time in the claimed CMCs.
- More publicity about the availability of the BIPM database is now desirable.
- There are still some questions with respect to the review routes chosen by those Nomi's that are members of more than one RMO; (Note that this is now clear on the BIPM KCDB following an enquiry from TJQ to each NMI).
- In the case that there is only one NMI with a unique capability in a certain region, then that region should approach another RMO to review the capabilities of that NMI.
- More feedback of the inter-regional review process, as a result of comments given, is desirable (cf Chairman's comments on the same issue above).
- It is not completely clear what should be understood under "fully reliable"; it is sometimes difficult to achieve a common view by all the experts involved in the review process.
- It is not clear how the entries in the database have to be chosen and sub-divided; differences are seen between the different NMIs and the RMOs.
- Dr Plantenga gave a presentation on the quality system review in EUROMET; the QS-Forum, as part of the EUROMET INTMET Working Group, acts as a platform on how quality systems are and can be implemented by the different NMIs (QS forum is not an assessment team); the results are laid down in the minutes of the meetings of the QS-Forum; on the basis of the results, further detailed discussions may take place if required by participants. Dr Plantenga also refers to the INITIATION leaflet. See also Doc. JCRB-6/05.
- See also Doc. JCRB-6/02.

MENAMET

- Four MENAMET countries are participating in the CIPM MRA, namely Turkey, France, South Africa and the United States. They all send their CMCs in via other RMOs.

SADCMET

- SADCMET has now 14 member countries and 3 new associate members (Uganda, Kenya and Egypt).
- The next plenary meeting of SADCMET will be held on 25 April 2001 in Lesotho.
- Quality system evaluation will be done via accreditation.
- NML South Africa has been visited by an international peer review team.
- See also Doc.JCRB-6/08.

SIM

- In several fields a further harmonization of the classification of services is needed.
- Quality systems are not yet considered by SIM; it is expected that the quality systems will be reviewed in one or two years.
- See also Doc. JCRB-6/03.

4a. Approval of CMCs for entry in Appendix C.

The following CMCs were approved by the JCRB:

- Gas mixtures: APMP: 3 countries; COOMET: 1 country; EUROMET: 10 countries; SIM: 1 country.
- Photometry and radiometry: APMP: 5 countries, EUROMET 14 countries; SADCMET 1 country; SIM: 5 countries**;** Note: approval of SADCMET and SIM countries is under the condition that the review process is finalized in accordance with the rules. Several APMP CMCs have been questioned and are still under consideration.
- Acoustics, ultrasound and vibration: APMP: 3 countries; EUROMET: 12 countries; SADCMET: 1 country; SIM: 5 countries; approval of SIM entries is under the condition that the review process is finalized in accordance with the rules.

In general, it is remarked that the CCs should make some statement on "how far the light does shine" for their various key comparisons. It has to be made clear by the CCs how far the CMCs are covered by the results of the key comparisons. TJQ will inform the CCs on this issue.

5. Appendix C: guidelines for preparing Excel spreadsheets.

Dr Thomas introduces the Document 6/06: BIPM Instructions for drawing up CMC Exel files.
Dr Erard suggests that a more systematic layout of document 6/06, making clear what is a requirement and what is guidance or recommended, will be useful. Dr Thomas replies that taking into account the complexity of the Appendix C it is very difficult to do this as there is often no clear distinction.
The Document 6/06 is accepted and will be available in the BIPM website.

6. Inter-regional review of CMCs, experience gained in applying the JCRB rules.

Differences exist between the RMOs in the way they apply the rules for reviewing CMCs; some are more strict than others. A better co-ordination between the RMOs and the Key Comparison Working Groups of the CCs is desirable. In addition, within the RMOs, the vertical flow of information from the JCRB representative to the technical experts may require some further attention.
The feedback from the RMOs to the BIPM and by the BIPM to the RMOs has to be improved in order to keep the review process under satisfactory control. The rules of procedure should be followed as much as is possible.
It was agreed that TJQ will set up on the BIPM website a confidential interactive box for indicating the status of and steps and dates in the review process of the CMCs.
See further Doc. JCRB-6/04 and Doc. JCRB-6/07.
(Note that the BIPM website interactive box for CMC review is now almost ready for trial and will be available soon).

7. Format for chemistry CMCs.

Dr Thomas gives a short explanation on the lay-out and the search engine for the Appendix C for chemistry. The search engine makes it possible not only to consider tabular forms of the CMCs but also more verbal

forms. She also points to differences in the way the different CMCs are presented; this leads to difficulties in the comparability of CMCs. Further harmonization is needed.
Where needed, explanatory notes will be added so that the user can understand what is meant by the different relations for measurement uncertainty, as well with respect to a correct understanding of the measurement uncertainty in relation to the claimed measurement range. There is not always a one to one relationship.
In the field of chemistry there are often several names in use for the same analyte. In order to solve this problem an extra column will be added with the unique CAS numbers for each analyte; this will greatly improve the efficiency of the search engine.
Dr Gary Mallard of NIST Chemical Databases Section has experience in database nomenclature and will support Dr Thomas with this issue.
The problems with the chemistry CMCs and the Appendix C will also be discussed with the CCQM Working Group chairmen on Saturday 10 March 2001 and in the CCQM during its meeting on 4-6 April 2001. (Note that as a result of a meeting that took place just after the CCQM a new format for the search engine was agreed that will be much more flexible and adaptable to the whole of chemistry)

8. Criteria related to Certified Reference Materials for entry in Appendix C.

Dr Kaarls identified some problems likely to arise with respect to CRMs to be mentioned in Appendix C as a means of disseminating traceability. The following principles have to be taken into account:

- Appendix C is not a catalog of all CRMs which can be delivered by an NMI;
- CRMs referred to are to be seen as the nature of service the NMI is delivering to its customers based on its own technical capabilities and competences;
- The characterisation (stability, homogeneity, etc.), validation and the assignment of values have to be done on the basis of the measurement capabilities and expertize that each CMC provider can itself can offer;
- Traceability to the SI (or another internationally agreed reference) has to be demonstrated in a clear and transparent way;
- The NMI or designated institute has to take full responsibility and liability for the CRMs referred to;
- Sub-contracting should only be possible on a very limited scale and under very strict conditions and supervised by the institute concerned;
- NMIs or the designated institutes have to participate in studies and key and supplementary comparisons;
- NMIs and the designated institutes have to fulfil all other criteria of the CIPM MRA, for example with respect to quality assurance.

The current situation in the field of measurements and traceability in chemistry is that many CRMs are not produced, analysed and certified by the NMIs or designated institutes. For example in Europe many CRMs produced under the BCR are analysed and certified in organizations other than the NMIs. Moreover, several NMIs deliver CRMs which have not been analysed and certified by themselves. This is in particular the case in fields like health and food. The EU and the WHO are establishing their own networks of “primary reference laboratories”.
It is extremely important that as soon as possible the NMIs appoint other key laboratories in their countries as designated institutes taking responsibilities for certain areas of metrology in chemistry, like health and food.

A first draft document on criteria for CRMs will be discussed on Saturday 10 March 2001 in a meeting of the CCQM WG chairmen.
A revised draft will then be discussed at the meeting of the CCQM on 4-6 April 2001.
The JCRB will then receive a report and final draft for consideration and approval at its meeting on 8-9 October 2001.

9. Procedure for updating or re-evaluation of CMCs already in Appendix C.

A first discussion on this point indicates the following:

- a periodic enquiry/review of the validity of the claims is needed, for example every 3 or 4 years;
- results of key comparisons give indications on the validity; these however are only momentary snapshots which are repeated relatively infrequently;

- the NMIs in the first place are responsible for the vallidity of the claims and the updating of the CMCs and secondly the RMOs have a responsibility for review, for example on the basis of the reported internal NMI review.

A more detailed procedure for updating will be drafted by the BIPM and will be discussed at the next meeting of the JCRB.

10. Procedure if more than one institute in the same country offers CMCs for the same quantity.

It is concluded that only one NMI or designated institute may claim a particular measurement capability; so, only one institute shall have national responsibility for a certain quantity and measurement range.

11. RMO responsibility for NMIs that are not yet connected to an RMO.

NMIs not connected to an RMO or an NMI that has no suitable peers in its own region have to be served by the existing RMOs.

In principle, a non-connected NMI has to agree with one of the existing RMOs that that RMO will take care of the interests of the NMI concerned and in particular carry out the intra-regional review of its CMCs. The NMI has to join in activities and comparisons organised by that RMO. Once an RMO has been chosen, all of the CMCs of that NMI must pass through this RMO. For example, South Africa is well served by APMP.

NMIs having difficulties should contact TJQ who will then assist in finding an acceptable solution.

12. Timetable for future submissions for Appendix C.

CMCs of the following fields may be expected for October 2001 meeting of the JCRB:

- mass, force, pressure, density, hardness, volume,torque and some of chemistry.
- CMCs of the following fields may be expected for the Spring 2002 meeting of the JCRB: temperature, flow, rest of length, rest of photometry and radiometry and more of chemistry.

With respect to "viscosity" it is remarked that the ad-hoc CIPM Working Group, chaired by Dr Kaarls, will first have a meeting later this year in order to discuss the situation with respect to traceability. This meeting was originally scheduled for the autumn of 2000, but had to be postponed because some data retrieval at NIST and primary measurements at NRLM had not yet finished.

As soon as the results of this ad hoc working group are available RKaarls will report back to the JCRB.

13. The content of and responsibility for RMO databases.

If an RMO wishes to set up a parallel database to the BIPM key comparison database (KCDB) containing equivalents of Appendices B and C, the JCRB emphasized that there are two constraints that must be accepted:

1. The part of an RMO database that is common with the BIPM database must be rigorously identical to the BIPM key comparison database.
2. If an RMO database also contains information about non-signatories of the MRA (non-Metre Convention members/non-CGPM Associates) then there should be a very clear distinction between the part of the RMO database that is common with the BIPM database, established under the procedures of the MRA and recognized by all the participants, and the local part which is not part of the MRA. The JCRB emphasized the importance of users not being misled.

Dr Semerjian and Dr Carpenter explained their need for a SIM database. It will contain information related to the many non-Member/non-Associate countries of the Americas. Although for these countries the MRA does not apply, SIM is making sure that the same procedures will be applied. NIST needs a database containing all the results of comparisons in which NIST is involved. This database will be used by the FAA and other agencies for decisions on international recognitions. TJQ said that NIST and the BIPM will consult together to set up an appropriate mechanism that meets the NIST requirements and points 1 and 2 laid out above.

Note from TJQ: Since the JCRB, taking account of the importance and size of the data in Appendix C, I now suggest that we call the database: **The BIPM key comparison and calibration database** with the acronym (as before) **KCDB.** I propose that from 1 June we make the change..

14. Guidelines for the publication of the results of key comparisons.

TJQ informed the JCRB that he, together with Dr Wielgosz of the BIPM, has written a document on "Guidance for the publication of the results of key comparisons" (see Doc. JCRB-6/13). This as a result of discussions that took place in the scope of the CCQM. The document will be discussed during the forthcoming meeting of the CCQM.

15. Other business.

- **Text on Calibration Certificates**

EUROMET proposes a text to be printed on the calibration certificates issued by the NMIs under the rules of the CIPM MRA. See Doc. 6/11.

The proposal is welcomed and after some discussion it is agreed that the common text should be in accordance with the relevant text of Art. 22 of the MRA.

The draft text (modified by TJQ after the meeting and now subject to approval by the JCRB) reads as:

This certificate has been issued under the provisions of the MRA drawn up by the CIPM. All participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities and ranges specified in Appendix C of the MRA (for details see http://www.bipm.org).

- **List of expert assessors on behalf of ILAC;**

ILAC has asked the CIPM during the tri-partite meeting with the OIML, ILAC and the CIPM/BIPM in February last to establish a list of NMI expert assessors with an international experience in assessment or peer evaluation. ILAC would make use of such a list when they are looking for acceptable expert assessors when carrying out an assessment of an NMI or an assessment of an ILAC member country, including a view on the capabilities and competence of the NMI of that ILAC member country (this in the case when the NMI concerned is not already recognized under the CIPM MRA).

The JCRB welcomes the initiative of ILAC for further co-operation.

However, the JCRB would like to have more details on the conditions under which these NMI experts will work and about the exact aims of and tasks in the ILAC assessment team.

TJQ will ask ILAC for further information and will report back at the next meeting of the JCRB in October 2001.

- **Supplementary and bilateral comparisons;**

RMO supplementary comparisons have to follow the same rules as key comparisons for their results to be published in Appendix B after a review of the CC concerned.

Bilateral comparisons can go in Appendix B as well. The BIPM will draft some guidance on this issue.

- **Publicity**

The BIPM will produce some promotional text and an A4 flyer/leaflet on the CIPM MRA and the BIPM KCDB.

More attention to publicity will be given, for example together with ILAC and the NCSL.

- **Dates and place next meetings of the JCRB.**

After some discussion, it is agreed that in principle the March meeting of the JCRB should take place in various regions around the world. The October meeting of the JCRB will always be held at the BIPM.

The following meetings have been agreed:

-8-9 October 2001 at the BIPM,
-5-6 March 2002 at the NML South Africa in Pretoria,
-October 2002 at the BIPM,
-March 2003 at the NMIJ in Tsukuba?

Closure of the meeting.

TJQ closes the meeting and expresses his thanks to our hosts of this meeting, NIST, for all the arrangements that have helped this meeting to be a successful one.

Note: Please note that the passwords given to you all at the JCRB are meant to allow access to the website by all those who have a need to view it. I expect you to make them available to others in the RMOs and NMIs closely related to the work (TJQ).

Appendices

Annex 1 List of participants with their affiliation and co-ordinates

Annex 2 List of documents presented at the 6th meeting of the JCRB

Annex 2

Doc. JCRB-6/01	COOMET Report
JCRB-6/02	Report by EUROMET representatives to the 6th JCRB
JCRB-6/03	SIM Report for the 6th meeting of the JCRB
JCRB-6/04	APMP Recommendation for the share of CMC Review
JCRB-6/05	Review Criteria and Procedures for EUROMET CMCs
JCRB-6/06	BIPM Instructions for drawing up CMC Excel files
JCRB-6/07	Inter-regional review of CMCs, experience gained in applying the JCRB rules (EUROMET)
JCRB-6/08	Report to the 6th JCRB, 8-9 March 2001 by SADCMET
JCRB-6/09	Time table for submission of CMCs to the JCRB for entry into Appendix C for the years 2001 – 2002
JCRB-6/10	Present situation for CMCs review in APMP
JCRB-6/11	Statement on NMI certificates covered by the MRA (EUROMET proposals)
JCRB-6/12	Report on the sixth meeting of the JCRB on 8-9 March 2001 at NIST, Gaithersburg Md., USA
JCRB-6/13	Guidelines for the publication of the results of Key Comparisons.

Report on the 7th meeting of the JCRB held at the BIPM on 8 and 9 October 2001.

Revised version 10 December 2001

Present:

T.J. Quinn	BIPM (Chairman)
R. Kaarls	CIPM (secretary)
H. Imai	APMP
K. Seta	APMP
B. Inglis	APMP
Shi Changyan	APMP
V. Belotserkovskyi	COOMET
D. Vassiliev	COOMET
A.I. Pokhodun	COOMET
A. Astashenkov	COOMET
L. Issaev	COOMET
W. Schwitz	EUROMET
A. Wallard	EUROMET
P. Hetherington	EUROMET
T.M. Plantenga	EUROMET
H. Ugur	MENAMET
F. Hengstberger	SADCMET
I. Castelazo	SIM
H. Semerjian	SIM
C. Thomas	BIPM
L. Le Mée	BIPM

A list of the participants with their affiliation and co-ordinates is added as Appendix 3 to this report.

1. Opening and welcome by the Chairman

The Chairman, Dr T. Quinn, opened the meeting welcoming the representatives of the RMOs and their accompanying experts in the new meeting hall of the BIPM.
The draft Agenda was approved, noting that a letter received from EUROMET and a few other points will be dealt with under point 15: Other business.
A list of the 22 working documents tabled is also attached as Appendix 4. The Appendices are also on the JCRB website www.bipm.org

2. Matters arising from the report of the 6th meeting of the JCRB

Documents 6 (APMP) and 9 (SIM) addressed points in the report of the previous meeting. However, document 6 was withdrawn during the meeting and not further discussed. Document 9 refers to the proposed statement to be put on calibration and measurement certificates from NMIs. Following a discussion, the text was amended and the JCRB adopted the following text:

This certificate is consistent with the capabilities that are included in Appendix C of the MRA drawn up by the CIPM. Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (for details see http://www.bipm.org).[1]

[1] Note: In making a French version it became clear that in French it is necessary to be more explicit than in English. The following is the French text that has also been agreed with L. Erard on behalf of the BNM:
Ce certificat est en accord avec les aptitudes en matière de mesures et d'étalonnages (CMCs) figurant dans l'annexe C de l'arrangement de reconnaissance mutuelle (MRA) rédigé par le Comité international des poids et mesures (CIPM). D'après les termes du MRA, tous les laboratoires participants reconnaissent réciproquement la validité des certificats d'étalonnage et de mesurage pour les grandeurs, domaines et incertitudes de mesure mentionnés dans l'annexe C (pour plus de détails, voir (http://www.bipm.org).

The JCRB proposes that each RMO and country be responsible for preparing texts in its own language. It is requested that copies of the various language texts be sent to the Chairman for the JCRB archives.

3. Report by the Chairman on progress since the 6th meeting

The Chairman gave a brief report on recent progress drawing attention once again to the huge amount of work that is represented by the growing content of Appendix C. He asked RMO representatives to pass on his appreciation and thanks to the contact persons in each RMO and in each field upon whose shoulders a great responsibility lies for the operation of the whole system. The fact that we have progressed so far so fast is in large part due to their efficiency and hard work. In this connection the Chairman also mentioned the need for close co-operation between the RMOs and the CCs and their Working Groups. The CCs are playing a role in the whole exercise, in particular the CC WGs on Key comparisons. At the occasion of the review in 2003 one may consider whether some additional rules for the whole process are needed.

Further, the Chairman mentioned the leaflet that he had prepared as suggested at the 6th meeting. The question of publicity for Appendix C was raised. It was proposed that at the PittCon in March 2002 and also at the NCSL in August 2002, the BIPM take a stand and have a live demonstration of the database. The Chairman agreed to look into this. It was also suggested that short texts be made available for inclusion in newsletters published by NMIs and other organizations, like ILAC, ISO, IFCC/WHO, WMO, WTO, EURACHEM, CITAC, EUROLAB, etc.. The Chairman agreed to prepare a short text suitable for this. Other matters related to the progress of the MRA come up in later points of the agenda.

4. Report on the KCDB

Claudine Thomas informed the representatives that the BIPM database related to the CIPM MRA is in fact "The BIPM key comparison and calibration and measurement capabilities database – KCDB". This title is however too long, so thus there is no shorthand way of referring to the KCDB other than what was written in the MRA, namely "key comparisons database". She then gave a presentation of the KCDB and answered many questions. It was agreed that the BIPM will begin now to make a log of the numbers and, if possible, the origin of who uses the KCDB.

The Chairman reported that on a number of occasions, members of CCs and working groups had questioned the need for the Tables of bilateral equivalence presented on the KCDB Appendix B. Although this was not strictly the responsibility of the JCRB he asked for its opinion. The general view was that these Tables were not necessary provided that, instead, instructions were given for calculating the bilateral equivalences if these were required.

The JCRB expressed its appreciation to Claudine and other BIPM support staff for all the work done to make the KCDB a success.

5. Reports by RMO representatives

Each RMO Representative presented a report on recent activities. These are on the JCRB website (see documents 7, 10, 14, 16 and 18). H. Ugur, representative of MENAMET reported that at present MENAMET is not active and he has no report to present. It was subsequently agreed between H. Ugur and the Chairman that for the time being MENAMET will be deleted from the JCRB interactive website www.bipm.org/JCRB

Several RMOs reported that there is a growing interest in becoming either a Member State of the Metre Convention or an Associate of the CGPM.

It was agreed that a common format for RMO reports to the JCRB should be used. A draft of such a list of contents was agreed and is appended to this report as Appendix 2 (document JCRB-7/22).

6. and 7. The JCRB website and communication within the RMOs and between the RMOs and the BIPM

These two items were taken together. There was a full discussion of the JCRB interactive website and a number of suggestions for modification were made. The JCRB decided that henceforth final, corrected, CMC files sent to the BIPM after inter-regional review will be posted on the interactive JCRB website for a period of not more than one month. By the end of this period, RMO representatives should indicate on the interactive website their approval after which the CMCs will be entered into the Appendix C. A warning will be sent if time limits are

exceeded or no answer is received. In the case of approval not being given by one or more RMOs, the CMCs will remain under review until the problem has been resolved. (*Note from the Chairman: The interactive website has been modified and the new version was put online on 24 October 2001. RMO Representatives are asked to be sure to place on the interactive website the appropriate information concerning whether or not they will review a given CMC and by what date*).

8 A. Inter-regional review of CMCs

Documents 3, 5, 8, 11, 12, 19 and 20 addressed this topic. Document 3 was held over until item 11. The recommendations given in document 5, were in principle accepted. There was a discussion on the rules for inter-regional review as presented in the Chairman's letter to RMOs dated 24 November 1999 and updated by the 5th JCRB and published as document JCRB-5/1. The JCRB requested the Chairman to look at these rules to see if they needed any updating. (*Note from Chairman: at first sight these rules seem to be adequate for the present except for minor revisions to take account of the procedures now used with the JCRB website; a slightly revised version, labelled JCRB-7/1 is appended as Appendix 1 to this report*). The points made in SIM document JCRB-7/11 were discussed and the JCRB accepted the proposals 1, 3 and 4 but thought that as regards point 2, it must be only the RMO representative who can actually change the interactive website.

When judging the CMCs, the question arises as to what is the real capability and competence of the NMI claiming the CMC and how much confidence do we have in the claim. This arises particularly when the NMI concerned is not well known to the reviewer; this is an even more burning question when there is no key comparison backing up the claimed CMC. The JCRB decided to ask the CCs to make statements on "how far the light is shining" in the report of each key comparison.

In Appendix C only the best calibration and measurement capabilities routinely available will be listed. This means "those services that are published (either on paper or electronically) by the NMI in its brochure or catalog of services available to their customers". Capabilities available at lower accuracy levels should not, in general, be listed in Appendix C, although certificates delivered for these lower level services may carry the MRA Statement (see above). However, it was remarked that in principle NMIs should not compete with accredited laboratories.

8 B. Inter-regional review of chemistry CMCs

A report was given by R. Wielgosz of the BIPM on the meeting of regional contact persons held at the BIPM on 5 August 2001 and subsequent teleconference on 13 September. The report of the meeting was distributed. As a result of the meeting it was agreed that the final date for sending to the BIPM final files arranged according to the format agreed at the 7th CCQM meeting would be 15 January 2002. In the Appendix C search engine it had been agreed at the August meeting to add a filter on the service category just above the keyword search.
Further harmonization of service categories may still be needed.

In order to avoid unfair competition between the NMIs much more co-ordination is needed in areas where capabilities are of a multi-disciplinary character e.g. electrical conductivity, viscosity and reference materials.
Electrical conductivity is a crucial chemical measurement. With respect to viscosity for the time being the *ad hoc* Working Group on Viscosity, established two years ago by the CIPM, is the co-ordinating body. With respect to Certified Reference Materials the proposal was made that CRMs of content are part of the CCQM and CRMs of properties are part of other fields/CCs.

It was also decided that in relevant cases with respect to the uncertainty claims of CRMs the following note in Appendix C may be added: "For this CMC k is not explicitly k=2 but for some CRMs included in this CMC k may not equal 2, although all uncertainties have a 95% confidence interval".

9. Approval of CMCs for entry into Appendix C

The following CMCs were approved for entry into Appendix C:
- a second set of CMCs in Photometry and Radiometry from APMP and EUROMET (published in KCDB on 10 October 2001);
- CMCs in Electricity and Magnetism from COOMET (published in KCDB on 24 October 2001);
- A second set of CMCs in length from EUROMET (published in KCDB on 30 October 2001);
- CMCs in general chemistry from APMP and SIM (to be published after 15 January 2002, see point 8B above).

The following CMCs were announced to be ready for submission after the 7th JCRB:
- CMCs in Acoustics Ultrasound and Vibration from SIM (approved on 30 October 2001, published in KCDB on 9 November 2001);
- CMCs in General Chemistry from COOMET (approved on 26 October 2001l, to be published after 15 January 2002);
- CMCs in Photometry and Radiometry from SADCMET (approved on 26 November 2001, published in KCDB on 28 November 2001).

CMCs in General Chemistry from EUROMET are not yet ready because unresolved problems remain with some CMCs from BAM. The JCRB invited EUROMET to submit all the rest and let the BAM CMCs follow when ready. This was agreed but at the time of writing this report no EUROMET CMCs in general chemistry have yet been received.

CMCs in Photometry and Radiometry from SIM are due to be submitted by the end of November 2001 for electronic approval.

With respect to the CMCs in thermometry the CCT task force is still working on the service categories. After this task force is ready W. Schwitz will confirm the Chairman whether the CMCs already submitted by EUROMET are in conformity with the CCT list of categories.

Reviews in the field of mass are underway.

The Chairman tabled a document (JCRB-7/4) on a proposed procedure for modifying CMCs already in Appendix C. The JCRB agreed to consider this and discuss it at the March 2002 meeting of the JCRB. Meanwhile, the Chairman said that he would use this procedure if any cases arose.
Please note that a slightly modified version of JCRB-7/4 is now on the JCRB website.

10. Interpretation of the phrase "significant unresolved deviation from the KCRV"

The Chairman explained the origin of the request that the JCRB make a pronouncement on the meaning of the phrase in paragraph T.7 of the MRA "significant unresolved deviation from the KCRV". After a short discussion the JCRB agreed with the Chairman that it is not appropriate that the JCRB pronounce on this point. Specific problems which may arise in a certain field should be discussed and eventually studied for example during a workshop on measurement uncertainty by the experts.

11. Inter-regional harmonization of Quality System reviews.

Document JCRB-7/3 was presented by A. Wallard and a discussion followed. It was agreed that updated versions of the documents submitted by RMOs to the 5th meeting of the JCRB (and referred to in JCRB-5/1 as being substantially equivalent), should now be prepared for the 8th meeting of the JCRB. The updated RMO documents should be received by the JCRB Chairman by 1 February 2002.

An *ad hoc* Working Group is established to formulate the minimum requirements on what has to be reported about the review of the quality systems of the NMIs.
The members of this *ad hoc* WG are:

P. Hetherington (convenor, Note; P.Hetherington replaces M. Plantenga)
H. Semerjian
K. Seta
R. Kaarls

The report of the *ad hoc* WG will be sent to the JCRB Chairman before 1 February 2002. In 2003 the issues with respect to the quality systems of the NMIs have to be solved and should be transparent. It is understood that the evaluation of the situation concerning quality systems is in the first place a responsibility for the RMOs. The requirements to be formulated should be performance based. A regular review from time to time is needed and should also be part of the procedure.

Reference is made to an OIML paper on quality systems in legal metrology based on ISO 17025 and dealing with accreditation as well as peer reviews.

F. Hengstberger remarks that in developing countries there is a tendency that NMIs are accredited and then become internationally recognized under the ILAC Arrangement. (*Note from the Chairman: ILAC accreditation accredits the calibration services of a laboratory with reference to its standards; for an NMI, accreditation does not give any international recognition to its standards, only participation in the MRA can do this.)*

12. Preliminary discussion on review of MRA due for October 2003

The Chairman invited RMO representatives to consider if any part of the MRA would need revision in October 2003. The transitional period will end in 2003. Minimum requirements for monitoring the maintenance and validity of the CMCs have to be formulated, including eventually sanctions. He said that the responsibility will lie with directors of NMIs but advice from the JCRB would be welcome. He agreed to write to RMO representatives formally inviting them to consider this point.

13. Timetable for future submissions for Appendix C

The following timetable was agreed:

Document JCRB-7/21

Timetable for submission of CMCs to the JCRB for entry into Appendix C.
09 October 2001

The JCRB at its meeting in October 2001 confirmed the timetable for entries into the BIPM database for the year 2002. In this timetable we refer to the steps labelled (a) to (i) in the Rules of Procedure for CMC entry into Appendix C (Document JCRB-5/1).

1. For the March 2002 meeting of the JCRB (8th meeting):

- *Deadline for submission of CMCs from the RMOs to the Chairman of the JCRB; step (b); submissions in the fields of temperature, flow, rest of length, rest of photometry and radiometry, mass and related quantities and ionizing radiation* ***15 November 2001***
- *Date by which comments from RMOs must be received, step (e);* ***31 December 2001***
- *RMOs send revised CMCs to the Chairman of the JCRB, step(g) ;* ***31 January 2002***
- *Meeting of the JCRB;* ***5-6 March 2002***
- *Publication in Appendix C;* ***May 2002***

2. For the October 2002 meeting of the JCRB (9th meeting):

- *Deadline for submission of CMCs from the RMOs to the Chairman of the JCRB; step (b); submissions in the fields of time and frequency, parts of chemistry, and all remaining fields* ***31 May 2002***
- *Date by which comments from RMOs must be received, step (e);* ***31 July 2002***
- *RMOs send revised CMCs to the Chairman of the JCRB, step(g) ;* ***31 August 2002***
- *Meeting of the JCRB;* ***October 2002***
- *Publication in Appendix C;* ***December 2002***

T.J.Quinn
Chairman, JCRB, October 2001
(Revised December 2001)

14. The content and responsibility for RMO databases

The Chairman reported that he had sent a draft contract to NIST for the proposed NIST/SIM database. He will inform RMO representatives when final agreement has been reached on this matter. F. Hengstberger indicated that SADCMET might also be interested in having a RMO database and that NIST had offered to help.

15. Other business

(a) The Chairman informed the JCRB that a Memorandum of Understanding (MoU) was close to being finalized with ILAC. He said this will result in closer relations between the CIPM/BIPM and ILAC and in particular that ILAC will make clear reference to the CIPM MRA in its documents and the BIPM correspondingly in its documents will refer to ILAC.

(b) The Chairman referred to a letter he had received from the Chairman of the CCEM working group on key comparisons in which a number of questions were asked (copy herewith). As regards the definition of services ordinarily available, the JCRB did not agree with the proposal that they be defined as only those services delivered under the quality system. Instead, the JCRB maintained its view that the presence of the service in a published (on paper or electronically) list of services offered by that institution was the necessary and sufficient condition. As regards the question of including or not the transport uncertainty in CMC uncertainty claims, the JCRB agreed to take up this question at its next meeting although it was noted that in general and in EA documents, transport uncertainty is not included in the uncertainty of the standard being calibrated but its performance during the calibration is.
It is decided that W. Schwitz (convenor), I. Castelazo, F. Hengstberger and R. Kaarls will prepare a document on the issue, to be discussed at the next meeting of the JCRB.

As regards modifications to existing CMCs, the JCRB has agreed a provisional procedure on the proposal of the Chairman and will take this up at its next meeting. As regards the final point raised in the letter, the JCRB took the view that an NMI can change the values of its standards as it likes but it is necessary that any change be publicly announced and the reason for the change and its magnitude be made clear. Any implication for its CMCs must, of course, also be taken into account. The Chairman will reply on behalf of the JCRB to the points raised in this letter.

(c) The Chairman was asked to clarify the rules regarding participation in key comparisons. He replied that this is not a matter for the JCRB but that he will take it up at the forthcoming meeting of the CIPM. (The Chairman will write to RMO representatives with the conclusion of the CIPM discussion on this subject).

(d) Dr Schwitz mentioned the case where an NMI recognized for certain capabilities under the CIPM MRA is not recognized by a National Accreditation Body, being a signatory to the ILAC Arrangement. How does this fit in the relationship between ILAC and the BIPM. He will inform the JCRB Chairman in more detail, so that appropriate action can be taken.

(e) Several points of a more general nature mentioned in the documents 7/2 and 7/15 will be presented to and discussed by the CIPM.

16. Date and place of next meeting

At the invitation of SADCMET, the next meeting of the JCRB will take place in Pretoria, South Africa, on 5 and 6 March 2002. The details of the programme and arrangements for the meeting will be distributed a little later.
The Chairman then adjourns the meeting.

Document JCRB-7/1

JCRB Rules of Procedure for CMC entry into Appendix C

Revised October 2001

The Rules of Procedure of the JCRB adopted at its 2nd meeting in February 1999 specify the steps required for an NMI's calibration and measurement capabilities to be entered into Appendix C. These Rules were modified at the 5th meeting of the JCRB and put on the JCRB website as JCRB-5/1.

Since then, an interactive website has been created for RMO representatives to the JCRB to enter actions related to review of CMCs. It is also intended for other interested parties in the RMOs to be informed of the status of every CMC during the review process. This interactive website is at www.bipm.org/JCRB and may be viewed using the login name "guest" and password "guest2001".

The creation of the interactive website has led to some modifications to the procedure. The revised procedure is as follows:

(a) The NMI sends its draft CMCs to the local RMO for review and approval according to the JCRB and RMO criteria (see below for summary of criteria and JCRB statement).
(b) The local RMO sends the approved CMCs to Chairman of JCRB with appropriate formal statement on behalf of the RMO representative to the JCRB. Reception of these CMCs is acknowledged on the JCRB interactive website with date.
(c) Chairman of JCRB forwards received CMCs to all other RMOs through their representative on the JCRB. This action is noted on the interactive website with dates. RMOs indicate on the interactive website whether or not they will review these CMCs and set date for completion of review.
(d) Inter-regional review takes place which includes direct contact between technical working group chairmen of RMOs; interim and final reports sent to Chairmen of their own RMO by each review team (see below for detailed rules on inter-regional review).
(e) Reports of reviews are sent through JCRB representatives to Chairman of JCRB with an official accompanying statement and he sends them on to chairmen of other RMOs. These actions are noted on the interactive website with dates.
(f) NMIs revise their CMCs as necessary and re-submit to local RMO.
(g) RMOs send their revised CMCs to the Chairman of the JCRB with the appropriate formal statement stating that all issues raised in inter-regional review have been resolved.
(h) Chairman of the JCRB puts revised CMCs on the interactive website setting a date not more than one month ahead for approval by RMOs. This and action (g) are noted on the interactive website with dates.
(i) Provided all RMOs indicate their approval on the interactive website, the CMCs are entered into Appendix C. This action is noted on the interactive website with the date of entry.

Criteria for acceptance of data for Appendix C

Paragraph 11.3 of the MRA foresees (provisional) data for Appendix C until such time as the first round of key and supplementary comparisons has been completed and until the quality systems referred to in Paragraph 7 have been put in place. It is important to ensure a reasonable uniformity in the criteria used by the RMOs in submitting data to the JCRB for entry into Appendix C. The Chairman of the JCRB sent a letter to Chairmen of RMOs on 24 November 1999 in which he gave a summary of the points that should be taken into account. These points have formed the basis of the individual documents drawn up by RMOs specifying in more detail the criteria to be used.

The JCRB at its 5th meeting in October 2000 reviewed these criteria and reviewed the separate procedure documents prepared by the individual RMOs. It found that the procedures of the different RMOs were in good agreement with each other and with the criteria of the letter of 24 November referred to above. For clarity, the JCRB decided to restate these criteria in a slightly different form and made the following statement:

The JCRB requires that the following points should be taken into account in evaluating CMC submissions:
1. Results of key and supplementary comparisons.
2. Documented results of past CC, RMO or other comparisons (including bilateral comparisons).

3. Knowledge of technical activities by other NMIs.
4. Active participation in RMO projects.
5. Appropriate measurement procedures and equipment.
6. Scientific and technical qualifications of staff.
7. Other available knowledge and experience.
8. Quality system existing or in preparation, brief description.
9. Any peer assessment, third party accreditation or self declaration, including the name of the accreditation body; membership of a multilateral agreement/arrangement; scope of accreditation; names of peer reviewers.

The JCRB emphasized the importance of having a broad spread of information covering as far as possible all of these points. Before the results of key and supplementary comparisons are available, increased emphasis should be placed on points 2, 3 and 4 and particularly on the results of visits implied in 3. Before quality systems are fully in place item 7 takes on an increased importance and particularly the peer reviews mentioned in 9.

Procedures for inter-regional review of CMCs

The JCRB at its 5th meeting in October 2000 made the following statement concerning inter-regional reviews of CMCs:

Inter-regional reviews of CMCs are principally to ensure that the agreed JCRB and RMO procedures have been correctly applied; they also assist in harmonizing RMO review procedures.

The JCRB recommends:

- that this inter-regional review should be carried out by the corresponding RMO working groups for the field in question;
- that these working groups should make a written report to their RMO Chairman;
- that this report should include the names of the members of the review team;
- that the review includes the detailed examination of a small number of the proposed CMCs chosen to evaluate the more critical CMCs.
- that the final reports should be sent to the Chairman of the JCRB who sends them on to RMO representatives on the JCRB.

The JCRB accepts that not every RMO will wish to review the CMCs of all NMIs in every other RMO; however, to ensure a reasonable coverage of review the JCRB recommends that the technical working groups of each RMO make contact and come to an agreement on sharing the task.

During the review process the JCRB recommends that communication is established directly between the appropriate working group chairmen to deal with questions and resolve, as far as possible, inconsistencies. Unresolved problems or disagreements that cannot be resolved by the technical experts must come to the RMOs and, if necessary, to the JCRB as foreseen in the MRA.

Appendix 2. **JCRB-7/22**

Suggested content of RMO report to the JCRB

1. General report on activities related to the MRA, RMO contact details including Chairman, Secretariat and JCRB representatives with their functions.

2. List of current TC chairs, contact details.

3. RMO membership update.
    - **Signatories of the Metre Convention, Associates to the CGPM, Participants in the MRA.**

4. Table of ongoing inter-regional review of the RMO's CMCs.

5. Table of CMCs reviewed from other RMOs.

6. Status of quality systems and review process in the RMO.

7. List of RMO key and supplementary comparisons in the region, with number of participants.

MINUTES OF 8th JCRB MEETING, 5-6 MARCH 2002

1. OPENING AND WELCOME BY THE CHAIRMAN

The JCRB Chairman welcomed all those present and thanked SADCMET for hosting the 8th JCRB Meetings. He also welcomed Dr Samuel as Executive Secretary to the JCRB.

The Draft Agenda was approved, with the addition of Agenda Item 16.5 as requested by Dr Schwitz – *Availability of JCRB documents to RMO Technical Committee Members.* [The Final Agenda is given in Appendix 1, with references to working documents provided.]

2. MATTERS ARISING FROM THE REPORT OF THE 7TH MEETING HELD AT THE BIPM

The Chairman referred to Document JCRB-8/2.

ACTION 1: Secretary to forward the short and long English version and the long French version of the Calibration Certificate Statement referring to the MRA to the Committee to be used by NMIs as appropriate.

2.1 REVIEW OF OUTSTANDING ACTIONS FROM ALL PREVIOUS JCRB MEETINGS

The Chairman referred to Document JCRB-8/2(1) for review by the Meeting. No new actions were required.

3. REPORT BY THE CHAIRMAN ON PROGRESS SINCE THE 7TH MEETING

The Chairman noted that most actions from the 7th meeting have been carried out, and the two *ad hoc* Working Groups have tabled reports at the 8th JCRB Meeting. He commented that he was pleased with the overall progress.

4. REPORT ON THE PRESENT STATUS OF THE KCDB

The Chairman referred to Document JCRB-8/4, which provides a lists of CMCs on the database. The Chairman noted that the requirements for the database are almost at the limit of what is technically possible using current Microsoft software.

- In the area of chemistry for gases, there is a searchable database that is to be extended to provide for all other CMCs. Dr Kaarls informed the Committee that during the CCQM Working Group discussions, it was agreed that the large matrix of bilateral degrees of equivalence now appearing in results of key comparisons is to be deleted, retaining only the single column of degrees of equivalence. A formula will be provided to allow the calculation of bilateral terms.

The Chairman noted that initially the difference between the values obtained by NMIs rather than between an NMI and the reference value had been thought to be the most important issue but now it is clear that the reverse is the case.

- One key comparison final report is coming in per week and being put into Appendix B.
- The Chairman announced that there is to be a new publication in *Metrologia* : a web-only Technical Supplement which is to come online (back-dated) from 1st Jan 2002 to provide results of CIPM and RMO KCs (key comparisons) and SCs (supplementary comparisons) and pilot studies. At present, the final report of these comparisons in the BIPM database is not easily citeable. Now, when the final report of a KC comes in, the abstract will appear almost simultaneously on the web Technical Supplement with a link to the database for the full report. The Technical Supplement will use the *Phys Rev* Journal's form of reference – i.e., no page number, just an article number. An Editorial will come out shortly in *Metrologia* concerning this.

ACTION 2: Chairman to send a copy of the *Metrologia* Editorial on the Technical Supplement to all Chairmen of CC Working Groups.

- Given the hundreds of CMCs in electricity, Dr M Reedtz has suggested a 3-dimensional matrix of uncertainties to reduce the number of CMCs by a factor of 10. This will be implemented in the second round of electricity CMCs now being prepared.
- A new search engine for Ionising Radiation is being developed.
- It is not possible to identify a majority of the visitors to the KCDB, since many come through service providers.
- A revised version of the MRA/KCDB leaflet has just been printed and copies are available. The BIPM, thanks to NIST, will be occupying part of the NIST booth at PITTCON, in March 2002.

ACTION 3: Secretary to distribute the revised BIPM leaflet to all RMOs.

Dr Issaev noted that COOMET's AUV submission is not mentioned in the report – this was sent in Oct 2001.

ACTION 4: Secretary to check on status of COOMET's AUV submission and to arrange for its inclusion on the database.

5. REPORTS BY RMO REPRESENTATIVES TO THE JCRB

APMP: Dr Imai

Dr Imai referred to Document JCRB-8/5(1).

ACTION 5: APMP to amend its' *Status of CMCs* document and re-send it to the JCRB Secretary.

ACTION 6: The Director of NMIJ to send a formal letter to the JCRB Chairman to inform him that HECTEF is nominated by Japan as a designated institute.

COOMET: Dr Belotserkovskiy

Dr Belotserkovkiy referred to Document JCRB-8/5(4).

ACTION 7: COOMET to forward Appendix 3 of its' RMO report to the Secretary.

Clarification was sought of the Rules of Procedure with regard to disputes regarding an RMO CMC review. The Chairman responded that issues that arise are to be discussed directly with the originating NMI, not with the RMO. Dr Schwitz added that, where a discrepancy is only editorial, then the RMO can make the amendment.

COOMET suggested that it would be useful if a representative from each RMO participates in all CCs. The Chairman noted that this is appropriately addressed by CCs, which ensure that there is proper regional representation. In addition, notification of CC meetings is provided on the BIPM CC webpages.

Dr Castelazo informed the meeting that he had recently received an invitation from the Chairman of CCM to designate one of the attendees from SIM as representing the RMO, so that she had the authority to speak about CMC reviews and comparisons.

ACTION 8: Chairman to ask Executive Secretaries of CCs to invite RMO Representatives to the JCRB to nominate which CC member is authorised to represent the RMO at CC meetings.

EUROMET: Dr Schwitz

Dr Schwitz referred to Document JCRB-8/5(2). He pointed out that EUROMET's *Status of CMCs* document does not include photometry and radiometry.

ACTION 9: EUROMET to amend its' *Status of CMCs* document and re-send it to the Secretary.

The Chairman informed EUROMET of the request from the BIPM that EUROMET Guidance Document No. 3, the "EUROMET Guideline on Conducting Comparisons", include the requirement that all EUROMET-initiated comparisons are notified to the Executive Secretary of the relevant Consultative Committee. This is necessary to

keep track of activities as well as ensure that the appropriate CC protocols are being followed. The CCRI has produced a questionnaire to address this requirement.

ACTION 10: Dr Schwitz to ensure that EUROMET Guidance Document No. 3 explicitly states that EUROMET-initiated comparisons are to be notified to the Executive Secretary of the relevant CC.

Dr Hengstberger requested a flow chart to identify the steps to be taken to register an RMO key or supplementary comparison.

ACTION 11: Secretary to draw up a flowchart/document indicating the steps needed to register an RMO Key or Supplementary Comparison and to forward this to Committee Members.

The Chairman reminded the Committee that, in order for a CMC to be included in Appendix C, the originating body needs to be a designated institute with its name in Appendix A.

Dr Sacconi expressed concern that the MRA uses the word "designated" to refer to institutes nominated by the government, however the ones to which Dr Quinn referred are not necessarily in this category. For example, an Italian law has *designated* 3 institutes, but each NMI may nominate others. He considered that these other institutes should be referred to differently in the MRA.

ACTION 12: Dr Sacconi to write a discussion paper giving his preferred terminology in the MRA for "designated institutes" in cases where the nominating body is not the relevant government. This proposal is to be tabled at the Directors' Meeting in April.

SADCMET: Dr Hengstberger

Dr Hengstberger referred to Document JCRB-8/5(3).

ACTION 13: ALL RMOs to send updated *Lists of Contacts* to Secretary when changes have been made.

Dr Hengstberger commented on the present status of SADCMET CMCs:

- SADCMET.L – EUROMET has asked for the CMC intra-regional review report. SADCMET has requested APMP to provide this.

ACTION 14: APMP to send SADCMET its intra-regional review report on SADCMET.L, which SADCMET is to then forward, with the CMC, to the JCRB Secretary to be sent on to EUROMET for review.

- SIM is providing the intra-regional review of SADCMET.PR.

ACTION 15: All RMOs, except SIM, to consider reviewing SADCMET.PR and to send their responses to the JCRB Secretary.

- The meeting agreed to accept SADCMET.RI.part2.

ACTION 16: Chairman to post approval of SADCMET.RI.part2 on the website.

- A short exchange on SADCMET.RI.part1 is required between SADCMET and the EUROMET reviewer. Dr Castelazo informed the Committee that a meeting was held within SIM in November to discuss these CMCs. Therefore, the progress regarding this CMC awaits further discussion between SIM, EUROMET and SADCMET.

ACTION 17: Secretary to pursue the status of the SADCMET.RI.part1 CMCs in one month (i.e., by the first week of April 2002).

- EUROMET is currently reviewing SADCMET.T.

Dr Hengstberger informed the Committee that a Regional Metrology Conference for East Africa will take place from 27-30 May in Nairobi (Kenya).

SIM: Dr Castelazo

Dr Castelazo referred to Document JCRB-8/5(5).

ACTION 18: Secretary to note that SIM CMC communications are to be sent to Dr Castelazo and copied to Dr Semerjian and Ing Mussio.

Dr Castelazo noted the importance of informing developing country NMIs of the difference in scale of expense between participating in the MRA as a member of the Metre Treaty and as an Associate to the CGPM: i.e., 50,000 Euros compared with 5,000 Euros.

He also informed the Committee that:
- SIM has recently sent in its EUROMET Thermometry review.
- There is to be a SIM symposium on Quality Systems on July 30.

He inquired about the situation of an RMO key comparison in which there are no direct linking laboratories. The Chairman confirmed that the MRA does not exclude this, provided an indirect link exists and appropriate uncertainties are included. This indirect link may be provided by NMIs who have taken part in comparisons that include participants in CIPM key comparisons.

Dr Hengstberger inquired whether the RMO database maintained by NIST is linked with the BIPM database. The Chairman replied that this is not yet the case but that a formal protocol has been agreed with NIST. He noted that for RMO databases it is preferable to have a link to the BIPM database rather than copying it, in view of the large amount of work otherwise required by the RMO.

The Chairman also noted that results of pilot studies are not on the KCDB but will be put on the webpages of each CC.

ACTION 19: Dr Castelazo to report back to the JCRB Secretary within 2 weeks (i.e., by 22 March 2002) on whether SIM will review COOMET.T.

If SIM is not doing this review, then it will be posted on the website for approval and only SADCMET is entitled to comment.

6. THE JCRB WEBSITE: DISCUSSION ON ITS OPERATION

(NOTE: This Agenda Item was discussed at the preliminary meeting held on Monday 4 March.)

The Chairman highlighted the need for notification from RMOs of what action they will take when they are notified of the presence of a CMC.

ACTION 20:
It was agreed that:

1. **If, for example, three RMOs agree to review a CMC and two do not then these two have abandoned their prerogative to review the CMC at any later stage.**
2. **RMOs are to provide the following:**
   - **acknowledgement of the receipt of the CMC, *plus***
   - **the date by which they will review the CMC, *plus***
   - **the reviewer's name. This will, in most cases, be a TC Chairman. The name of the reviewer is to be provided so that reviews can be followed up.**
3. **An automated reminder will be sent to all RMOs if no acknowledgement of a CMC is received within 3 weeks.**
4. **The Secretary will send out a reminder after 3 weeks of the review deadline given by an RMO. This will be sent to both the individual responsible *and* the RMO contact.**
5. **A log book will be set up to sit behind each CMC to provide an "at a glance" synopsis of the status of the CMC. This will be accessible to RMO reviewers to allow them to provide information on the status of the review.**
6. **If an RMO review deadline has to change, it is the reviewer's responsibility to notify the JCRB Chairman.**

7. **Every 3 months, the Executive Secretary will send out a summary document of the status of all CMCs.**

ACTION 21: RMOs to inform the Executive Secretary of any additional information they require in the 3-monthly *Status of CMCs* summary.

7. INTER-REGIONAL REVIEW OF CMCs

7.1 KEY COMPARISONS AND CMCs THROUGH THE SAME RMO:

The Chairman reminded the Committee that if, for example, an NMI takes part in a EUROMET key comparison, then it should not submit its CMCs through APMP.

Dr Castelazo agreed that this is generally the case but may not always be true so should not be stated formally. COOMET supported this view and it was agreed that there should be some flexibility to this.

7.2 INTER-REGIONAL HARMONISATION OF CMC REVIEW PROCESS

Dr Schwitz inquired about what should be expected to accompany the report on the CMC from the RMO. He proposed that commentary should be provided on how the list of criteria in the Rules of Procedure have been addressed. The Chairman agreed that a checklist should form part of the main report.

ACTION 22: RMO CMC submissions should include the report on the intra-regional review. Inter-regional review reports should then include a checklist indicating which of the items in the list of criteria provided in (what is now) Document JCRB-8/13(1b), *Criteria for acceptance of data for Appendix C*, have been addressed, with associated comments.

7.3 ACCEPTABLE EVIDENCE FOR CMCs DURING TRANSITIONAL MODE OF MRA

APMP tabled its Position Paper, Document JCRB-8/7(3).

The Chairman noted that the Rules of Procedure do not currently mention traceability of national standards to another NMI that has participated in KCs. During this meeting, the relevant section of the Rules of Procedure was amended to take Recommendation (i) of the APMP Position Paper into account.

The revised document (see also discussion under Agenda Item 13.1) became Document JCRB-8/13(1b).

It was agreed that Recommendation (ii) of the paper is implied.

Dr Seta informed EUROMET that APMP will be forwarding the results of NIMT's participation in bilateral comparisons.

7.4 NAMING OF RMO CMCs

ACTION 23: Secretary to delete obsolete CMCs (e.g., EUROMET.AUV.part1) and discuss appropriate actions with RMOs when duplications occur.

7.5 RMO REVIEW DEADLINES

This issue is to be re-considered once the new system discussed under Agenda Item 6 is in place.

7.6 CMCs from IAEA

The Chairman proposed that the IAEA CMCs should be accepted. Dr Hengstberger commented that SADCMET had also reviewed these and only had minor remarks. Dr Kaarls noted that, before these could be accepted, information is required on the status of IAEA's quality systems.

ACTION 24: The BIPM (Dr Allisy-Roberts) to coordinate the preparation of a report, in consultation with COOMET and NMIJ, on the Quality Systems status of IAEA to be provided to the JCRB Chairman to accompany the IAEA CMC submission. The final report will be circulated to the JCRB Committee.

7.7 ROLE OF EXECUTIVE SECRETARY IN MANAGING PROCESS

ACTION 25: The Executive Secretary to provide a *Status of CMCs* document a few weeks before each JCRB meeting.

8 CHEMISTRY CMCs

8.1 UNCERTAINTY IN CHEMISTRY CMCs

Dr Kaarls informed the Committee that discussion is going on regarding the relationship between uncertainties of CRMs and the capabilities that the institute delivering the CRM normally provides the customer. Therefore there could be two uncertainties stated for one institute, one for the assigned value of the reference material (determined using different technologies, which can lead to smaller uncertainties) and another for the analysis capability (i.e., the measurement capability normally offered to customers). The final results of this discussion will be reported back to the JCRB.

ACTION 26: Dr Kaarls to provide the JCRB with a report on the outcome of the discussions on uncertainty in chemistry CMCs.

8.2 CRITERIA FOR ACCEPTANCE OF CRMs in CMC CLAIMS

Dr Kaarls referred to Document JCRB-8/8(2). There has been discussion in the CCQM for nearly 2 years on the acceptability of CRMs in Appendix C, and on what type. It is not intended to be a full catalogue of all available CRMs. What will be included is the capability of NMIs in this area, but not other organisations that may produce CRMs. The problem is that a lot of NMIs sell CRMs that they don't characterise themselves – e.g., IRMM, in which 50% of BCR reference materials are not characterised by the IRMM or another NMI. It is clear that in many cases there is no traceability. Therefore, the outcome is that only CRMs that have been characterised by an NMI or IRMM can be included. Also, only the uncertainty of which the NMI is capable is what can be provided. The JCRB's opinion is now sought and the CCQM is then looking for the CIPM to approve this policy.

The key point is that, in NIST's case, the assignment of values and characterisation is done by NIST as opposed to BCR RMs where the assignment and characterisation is often done by other laboratories whose competence is unknown. As far as quality systems are concerned, NIST has procedures that have to be fulfilled by these manufacturers, and as well NIST samples the SRMs.

ACTION 27: JCRB to note and accept rather than making a formal statement.

NOTE: Mr Mike Peet, Chairman of ILAC, was invited to join the JCRB Meeting for discussions under Agenda Items 9,11, and 16.2.

9 TRANSPORT UNCERTAINTY IN CMC CLAIMS

Dr Schwitz referred to Document JCRB-8/9. He noted that in the *ad hoc* Working Group's Report it had been agreed that CMCs are best measurements that an NMI can provide its customers under normal conditions.

Mr Peet was invited to raise ILAC's concerns with the Committee.

9.1 JCRB DEFINITION OF "CMC" FOR ILAC AND USERS OF MRA

Mr Peet stated that in the accreditation fraternity the interpretation of a BMC refers to the ideal measurement situation, rather than the best capability normally provided to customers. The concern is that different interpretations may be applied and that it is imperative that there is a common understanding between NMIs and accreditors.

Dr Castelazo noted that not everybody in SIM agreed with the recommendations of Dr Schwitz's group. There is the fear that an NMI's capability to calibrate a "nearly ideal" instrument will not be shown.

9.3 APMP PROPOSALS ON UNCERTAINTY CALCULATIONS FOR CMCs

Mr Lam then referred to Document JCRB-8/9(3). He noted that APMP has a similar position to the Working Group. Mr Kaarls pointed out that the APMP paper refers to capabilities offered to internal clients.

ACTION 28: Chairman and Secretary to write a definitive document stating what a CMC is, based on Documents JCRB-8/9 and /9(3). This should have a footnote that care must be taken that the very best instruments are not the ones to which reference is being made (i.e, taking account of the concerns raised by SIM). This document will be circulated to the Committee for agreement. When agreed, the JCRB Chairman will send the document to the ILAC Chairman and it will then be posted on the website.

The Chairman reiterated that CMCs are services that are ordinarily available.

The dialogue with ILAC is to be at the ILAC-CIPM level but this does not prevent a regional level dialogue also being instituted. The results of the ILAC-CIPM discussion could be put into the ILAC-CIPM MoU.

9.2: TRANSMISSION OF CALCULATION OF MEASUREMENT UNCERTAINTY FROM NMIs TO ACCREDITED LABORATORY NETWORK

Mr Peet stated that what is required is a working person's version of the determination of uncertainty that NMIs use. He informed the JCRB that he would pursue within ILAC the processes required for transmission of uncertainty calculations to the accredited laboratory network.

10. REVISION OF CMCs: APPROVAL OF DRAFT DOCUMENT TABLED AT 7TH MEETING

The Chairman noted that the only change to this document, JCRB-8/10, is at the beginning of c) where the words "or increase in scope" were added. The Document was approved by the Committee without further comment.

ACTION 29: Secretary to post Document JCRB-8/10 on the website as a JCRB Document.

11. INTER-REGIONAL HARMONISATION OF QUALITY SYSTEM REVIEWS

Dr Hetherington tabled Document JCRB-8/11, the Report of the *ad hoc* Working Group on Inter-regional Harmonisation of Quality System Reviews. He reminded the Committee that the role of this group was to produce guidelines on what an RMO should provide to the JCRB in terms of reviewing member NMIs' quality systems.

Ing Mussio noted that there is one case in which a SIM Member has a quality system that is not based on any written standard and that this is allowed by the MRA.

Dr Kaarls proposed that the scope of accreditation should also be provided, and that having the accreditation report would be an additional element in building confidence.

Dr Seta sought clarification of the second last paragraph of the Working Group's report

> *"In the case of a QS, which has not been assessed by an accreditation body or has not been reviewed by peers, the report should detail any evidence, which exists that provides the RMO with full confidence in the claimed QS."*

as to what sort of report is necessary and what sort of evidence is expected.

Dr Hetherington summarised this and further discussion by proposing that the RMO should be asked to state on what basis it made the judgement regarding an NMI's Quality System.

It was agreed that, along with the names of assessors, the Quality System report should identify the part of the scope each assessor was asked to accredit.

Dr Castelazo added that Dr Semerjian has requested more time to discuss this paper.

ACTION 30: Dr Hetherington to discuss Document JCRB-8/11 further with Dr Semerjian of NIST. Dr Hetherington to then revise the paper taking these comments into consideration as well as the discussions today and re-send the document to the Secretary.

11.1 INITIATION PROJECT

Dr Sacconi referred to Document JCRB-8/11(1) and noted that the website for this project is www.initiation.nl.

ACTION 31: Dr Sacconi to request that the INITIATION Project Leader provides a summary report (rather than a full report) to the JCRB.

11.2 COOMET RECOMMENDATION ON THE EVALUATION OF QUALITY MANAGEMENT SYSTEMS OF NATIONAL METROLOGY INSTITUTES

COOMET noted that Document JCRB-8/11(2) is for information only.

11.3 REGULAR MEETINGS OF TECHNICAL ASSESSORS/REVIEWERS EMPLOYED IN EVALUATING THE TECHNICAL COMPETENCE OF NMIS (WITH ILAC PARTICIPATION)

Dr Kaarls informed the Committee that ILAC is seeking a mechanism to harmonise the views of accreditors/NMIs.

It was agreed that if necessary ILAC would be invited to RMO TC Meetings where issues arose in the accreditation of NMIs and that, correspondingly, ILAC would invite TC members to such ILAC meetings when necessary. No action is required by the JCRB.

11.4 INFORMATION ON APPROACHES TO CLAUSE 7.3 ON BIPM MRA WEBSITE

This Agenda Item was not discussed at this time.

ACTION 32: Secretary to request that the *ad hoc* Working Group on Inter-regional Harmonisation of Quality System Reviews considers the ILAC request for information on how NMIs have addressed Clause 7.3 to be made available on the MRA Website, and provides comments for discussion at the 9th JCRB Meeting.

12. NOTIFICATION OF DESIGNATED INSTITUTES

The Chairman reminded the Committee that NMIs that wish CMCs of other designated institutes to be included in Appendix C need to notify the Director of the BIPM that these are officially designated institutes.

The Chairman raised for the Committee's awareness the issue that when a designated institute is a commercial company there appear to be problems of commercial advantage. The concern is what is the status of the products produced by this company when one of its laboratories is a designated institute but its products are sold worldwide.

Dr Kaarls responded that as long as the company has a unique position in their market this is acceptable but when there are competitors there may be complaints. There have been two such cases over the last months. If this becomes a WTO case, for example, how strong is the CIPM MRA to maintain this?

The Chairman replied that the individual countries would be held responsible. Neither the CIPM nor the MRA itself could be criticised.

ACTION 33: BIPM Director to raise the issue of cases where designated institutes are commercial companies at the April Directors Meeting, with the suggestion that Directors try to ensure that activities identified in the MRA are separated from the institutes' commercial activities.

Dr Hengstberger noted that in SADCMET a lot of countries are forming institutes, so it would be helpful to draft a position paper to provide guidelines and examples of the issues of which to be aware. This was agreed.

Dr Castelazo objected that it is not the role of the JCRB to discuss the advisability of having commercial companies maintaining national standards.

ACTION 34: BIPM Director to draft a position paper on guidelines regarding designated institutes that are commercial companies, to be raised with the CIPM. Drs Schwitz and Kaarls to assist.

13 DISCUSSION ON REVIEW OF MRA DUE FOR 2003

13.1 END OF TRANSITION PERIOD OF MRA

Initial discussion under this Agenda Item took place during the Preliminary Meeting held on Monday 4 March. Further discussion was held during the JCRB meeting proper, resulting in the paper, Document JCRB-8/13(1), provided in Appendix 3(a). The policy in this document was agreed by all RMO Representatives and the Chairman undertook to present it to Directors at the Directors Meeting in April.

ACTION 35: Document JCRB-8/13(1) to be tabled by the JCRB Chairman for discussion at the April Directors Meeting.

Additional actions that arose from this discussion were:

ACTION 36: BIPM Director to formalise the role of CC WGs on KCs in reviewing relevant CMCs each time a new key comparison is completed.

Dr Hetherington noted that CMCs also need to be reviewed on completion of supplementary comparisons and bilateral comparisons and that this is the responsibility of RMOs.

Dr Castelazo noted that the WGs on KCs are also meant to be looking at the likely CMCs to be supported by the results of each KC as they are identified.

ACTION 37: Chairman and Secretary to draft a document on the criteria that would lead to a review of CMCs already in Appendix C.

Dr Kaarls added that a review of the quality system should be part of this, so that RMOs can monitor changes in staff.

One of the actions that came out of Document JCRB-8/13(1) was that the JCRB Rules of Procedure also needed to be revised. The revised document is provided in Appendix 3(b) as Document JCRB-8/13(1b). It was agreed that this document only applies until the end of the transition period.

ACTION 38: Based on paragraph H of Document JCRB-8/13(1), the *ad hoc* Working Group on NMIs Quality Systems is to draw up criteria to be used in the monitoring of the operation of quality systems under Paragraph 7.3(b). The draft criteria are to be circulated to the JCRB by the *ad hoc* Working Group before the next JCRB meeting, i.e., before October 2002.

Dr Hengstberger was added to the existing *ad hoc* Working Group which now comprises: Dr Hetherington (Convenor), Dr Semerjian, Dr Seta, Dr Kaarls and Dr Hengstberger.

Dr Sacconi noted that, in Europe, there is at least one case in which Clause 7.3(a) has been taken literally as only requiring an assessment rather than requiring an accreditation. Dr Kaarls stated that it is clear that the implication of 7.3(a) is accreditation and it is dangerous to interpret it differently.

It was agreed that the text of Clause 7.3(a) actually means 3rd Party accreditation.

13.2 SCOPE OF JCRB RESPONSIBILITIES

Dr Castelazo noted that one aspect that should be re-considered is the involvement of regulators in the MRA.

14. TIMETABLE FOR FUTURE SUBMISSIONS FOR APPENDIX C

No actions required due to notifications on website.

15. CMC APPROVAL ON THE JCRB WEBSITE

This was discussed under Agenda Item 6.

16.1 PUBLICITY

ACTION 39: Secretary to regularly draft a one-page summary of activities and to distribute this to the JCRB as well as post it on the website to be used for publicity purposes by individual RMOs and NMIs.

Dr Schwitz noted that there is to be a session on the CIPM MRA at CPEM 2002.

ACTION 40: Secretary to add SIM publication, *INFOSIM*, to list of publications.

ACTION 41: Secretary to send out MRA/KCDB posters to RMO Representatives and arrange for these to be available electronically.

16.2 ILAC-BIPM MoU

ILAC has requested a list of appropriate assessors/reviewers. Members of the JCRB Committee had expressed concern at the Preliminary Meeting that this could imply some kind of personnel certification. Mr Peet informed the Committee that the objective is to ensure that the same assessments are being made no matter who is doing them.

The Chairman proposed that the Directors of NMIs be asked to provide this list. The next step would be for the relevant NMI Director and Accreditation Body to discuss details.

Mr Lam informed the Committee that the APLAC MRA Council maintains a list of "evaluators", which includes identifying suitable assessors from NMIs at a national level to be referenced at the regional level.

COOMET suggested that candidates from RMOs should be agreed by the COOMET Technical Committee of Quality Forum.

Dr Castelazo proposed that the SIM Working Groups could be asked to provide the list.

Dr Schwitz suggested that the JCRB could help identify criteria to be fulfilled by assessors/reviewers so that NMIs know what they should look for.

ACTION 42: Chairman to ask Directors at the Directors meeting in April whether they are willing to put forward a list of assessors that can be provided to ILAC. The Chairman to also draft a short list of criteria to be met by assessors.

Dr Schwitz noted that it is against the policy of some accreditors to reveal the names of assessors. Mr Peet agreed that this was a problem and had been the subject of recent discussion. He undertook to inform the JCRB Chairman of the outcome of these discussions.

The Chairman noted that there were no other items for discussion here.

16.3 ASSISTING PARTICIPATION BY DEVELOPING COUNTRY NMIs IN THE MRA

The Chairman noted that Document JCRB-8/16(3) is more a matter for the CIPM and NMI Directors.

He then informed the Committee of the UNIDO-ISO-ILAC-CIPM collaboration and the forthcoming meeting on April 24 2002 at the BIPM. The meeting will involve: ISO, ISO CASCO, ISO DEVCO, BIPM, UNIDO, ILAC and IAF – i.e., organisations providing a link between donors and developing states. It is aimed at setting up an

MoU with UNIDO and working together on a harmonised approach to the WTO to tackle the issue of standards for developing countries. This is to be undertaken with equal responsibility by all participants.

In addition, ISO has received funding to undertake a project with the WTO on metrology, accreditation and standards. There will be a meeting on 28 September 2002 to discuss this.

Dr Hengstberger noted that SADC is also much involved in these activities in its region. He added that UNIDO is not a donor but an *implementing* body.

ACTION 43: Dr Castelazo to inquire about OAS participation (Dr Oscar Harasic) in the meeting with UNIDO on 24 April 2002 at the BIPM and Dr Seta to inquire about APMP DEC/APEC SCSC involvement. The responses are to be forwarded to the Chairman.

ACTION 44: Chairman to discuss the joint meeting with UNIDO on 24 April 2002 at the April Directors Meeting.

16.4: LINKS WITH MRA DATABSE

The Chairman noted that these are to be inward links, not outward links.

(NOTE: A new Agenda Item was added.)

16.5: THE AVAILABILITY OF JCRB DOCUMENTS TO TECHNICAL COMMITTEE MEMBERS

Dr Schwitz commented that TC chairs would like to obtain RMO reports.

ACTION 45: Secretary to arrange for a new website to be established to be open to RMOs and their Committees. Secretary to forward password to JCRB Committee Members.

ACTION 46: At the end of JCRB meetings, the Committee is to identify papers to be put onto the open RMO website.

ACTION 47: Secretary to put up the following documents from the 8th JCRB Meeting on the open RMO website:

8/4;
8/5(1)-(5) – A*PMP (Dr Seta), EUROMET (Dr Schwitz) and SIM (Dr Castelazo) to amend their reports then forward to Secretary to be posted on web.*
8/7(3)
[not 8/8(2) yet]
8/9 – *Convenor of Working Group (Dr Schwitz) to combine this with JCRB-8/9(3) then forward to Secretary to be posted on web.*
8/10
8/11 – *Convenor of Working Group (Dr Hetherington) to amend then forward to Secretary to be posted on web*
8/11(2)
(not 13.1 – goes to Directors meeting)

17. DATE AND PLACE OF NEXT MEETING

The next meeting of the JCRB is on 3-4 October 2002 at the BIPM.

The next meeting to take place outside the BIPM will be in one year (March 2003) in Tsukuba, Japan. The provisional dates are 3-4 March. NMIJ/AIST is intending to hold a workshop/seminar in conjunction with this meeting to mark the 100-year anniversary of the foundation of the former NRLM.

18. CLOSE

The Chairman closed the meeting and thanked the hosts SADCMET and NML-CSIR.

REPORT OF 9th JCRB MEETING, 3-4 OCTOBER 2002

1. OPENING AND WELCOME BY THE CHAIRMAN

The JCRB Chairman welcomed all those present. The Draft Agenda was approved, with the addition of Agenda Item 13.5, *Proposed Working Group on Uncertainty Analysis,* as requested by Dr Semerjian. [The Final Agenda is given in Appendix 1 incorporating all modifications, and providing references for all working documents.]

2. MATTERS ARISING FROM THE REPORT OF THE 8TH MEETING HELD AT NML-CSIR, SOUTH AFRICA

The Chairman referred to Document JCRB-9/2. He then invited the JCRB Executive Secretary to review outstanding matters. The following specific Actions were discussed:

Action 6: HECTEF's status – Dr Seta informed the meeting that this is awaiting finalisation within Japan.

Action 8: As an extension of this, the Chairman informed the Committee that he had been asked whether senior BIPM staff would be available to attend specific RMO technical meetings.

ACTION 1: In order to ensure appropriate BIPM representation, RMO Representatives are to send a yearly calendar of RMO activities to the JCRB Exec Secretary, highlighting meetings at which attendance by senior BIPM staff is requested.

Action 10: Dr Schwitz noted that EUROMET Guidance Document No. 3 now explicitly states that EUROMET-initiated comparisons are to be notified to the Executive Secretary of the relevant CC.

Action 11: The Exec Secretary noted that the flowcharts for registering RMO key and supplementary comparisons were forwarded to JCRB members for comment and are now available on the "Meeting Documents" *and* "Working Documents" sections of the JCRB website, i.e., accessible by RMO TC/WG[1] members also.

Action 12: Dr Sacconi informed the Committee that the discussion paper on "designated institutes" has not been finalised. It is pending on-going discussion about the appropriate terminology for different types of institutes that may be "designated" in the MRA.

Discussion on Action 14 was postponed until Agenda Item 6; discussion on Actions 32 and 38 was postponed until Agenda Item 10; discussion on Actions 39 and 41 was postponed until Agenda Item 13.1.

3. REPORT BY THE CHAIRMAN ON PROGRESS SINCE THE 8TH MEETING

The Chairman commented that most actions from the 8th meeting have been carried out.

He raised the issue of calibrations undertaken by the BIPM for Member States. He noted that responses from the Questionnaire sent to Directors in late 2001 indicated that there is overall high appreciation of this BIPM activity, but that the question was raised whether this is a responsibility that could be taken up by the RMOs. He requested RMO representatives to the JCRB to inform him of their views informally during the course of the meeting. Dr Schwitz inquired about traceability of calibrations provided by the BIPM in the context of the CIPM MRA, i.e., what conditions should the BIPM fulfil in this regard. The Chairman responded that the BIPM is putting in place a Quality System to support its calibration services in order to address this issue.

4. REPORT ON THE PRESENT STATUS OF THE KCDB

The Chairman referred to Document JCRB-9/4, provided by the KCDB Coordinator, Dr Claudine Thomas. He then invited Dr Thomas into the meeting, to present her report.

Dr Thomas noted that the overall statistics of data available in the KCDB are provided in the report. She drew the Committee's attention to the following specific issues:

[1] All references to TCs in this document refer to Technical Committees or Working Groups, whichever terminology is appropriate for a particular RMO.

1. Non-uniform changes to service categories among RMOs

ACTION 2: RMO-JCRB Representatives are to request that RMO TC/WG Chairs contact the KCDB Coordinator when changes are necessary to service categories so that this can be done in a coordinated way across all RMOs.

ACTION 3: The JCRB recommends that RMO TC/WG Chairs meet regularly at least once per year, including scheduling a meeting in association with CC meetings.

Dr Semerjian pointed out that the CMC review process seems to be much more efficient when it is undertaken at a joint meeting at which all the relevant RMO representatives come together, as is the case within the CCQM and CCL. He suggested that this approach be encouraged within all CCs.

ACTION 4: The JCRB recommends the formation of separate *Working Groups on CMCs* within each CC[2] with the main objective of facilitating the review of CMCs. All RMOs are to be represented within these Working Groups, even if they are not members of the CC - the Chairs of the relevant RMO Technical Committees/Working Groups are to have automatic membership on these Working Groups.

Dr Semerjian drafted the Terms of Reference for these Working Groups – these are provided in Document JCRB-9/8(4-rev)[3].

2. Only CMCs of designated institutes can be published in the KCDB.

Dr Valdés sought clarification of the difference between designated NMIs and designated institutes. The Chairman responded that the MRA states that, within each country, there is one signatory institute which signs on behalf of all designated institutes responsible for maintaining national standards in the country. Only CMCs from institutes listed in Appendix A can be published in Appendix C. It is up to each country to decide which institutes are to be designated. Other institutes can participate in CIPM key comparisons but their results will not be published in the KCDB. Any institute that meets the membership requirements of an RMO can participate in RMO comparisons.

Dr Sacconi commented that problems arise with institutes that only contribute one or two CMCs in a very narrow range of areas.

3. Publication of supplementary comparisons

Dr Thomas informed the Committee of the discussion underway regarding the usefulness of publishing supplementary comparison results in the KCDB. She highlighted in particular the comment provided in Document JCRB-9/4 by Dr Quinn, that:

"The MRA makes no statement regarding what must be published in the KCDB as regards a supplementary comparison, so we are free to choose."

5. CHEMISTRY CMCs

The Chairman drew the Committee's attention to the two documents JCRB-9/5[1] and [2].[4]

6. REPORTS BY RMO REPRESENTATIVES TO THE JCRB (including the status of CMC reviews)

The Exec Secretary tabled Document JCRB-9/6, in which the current status of CMC reviews is provided. She noted the current outstanding issues regarding overdue reviews and approvals and requested RMO-JCRB representatives to provide her with an update on these actions during the course of the meeting.

6.1 APMP: Dr Imai

Dr Imai tabled Document JCRB-9/6(1), summarising the main points. He informed the Committee that the position of APMP Executive Secretary has been transferred from Dr Katuo Seta to Dr Takashi Usuda.

On behalf of the Committee, the Chairman thanked Dr Seta for his efforts with regard to the JCRB and welcomed Dr Usuda.

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[2] Note: Following the 9th JCRB Meeting, the CIPM in 2002 resolved that the formation of these Working Groups and their meeting at the time of a Consultative Committee are to be encouraged but that they are not to be *Consultative Committee* Working Groups.

[3] The Terms of Reference drafted by Dr Semerjian have been revised since the 9th JCRB meeting to reflect the decisions of the CIPM, consequently the current document is JCRB-9/8(4-**rev**).

[4] Note that Document JCRB-9/5(3) was provided subsequent to the 9th JCRB Meeting.

Dr Usuda noted that the report requested for the CMCs APMP.EM.1.2001 was provided as part of Document JCRB-9/8(1b).

ACTION 5: APMP is to provide an updated RMO report to the Executive Secretary.

6.2 COOMET: Dr Belotserkovskiy

Dr Belotserkovskiy referred to Document JCRB-9/6(2). He directed the Committee's attention to the new COOMET structure, provided in Appendix 2 of the report. This re-organisation was mainly aimed at simplifying tasks in relation to the MRA.

6.3 EUROMET: Dr Hetherington

Dr Hetherington tabled Document JCRB-9/6(3), summarising the main points. He then requested Drs Schwitz and Sacconi to report on Sections 4, 5, and 6 (On-going Inter-regional review of EUROMET CMCs; On-going reviews of Other RMOs' CMCs by EUROMET; Status of Quality Systems and Review Process).

Dr Schwitz noted that problems had arisen among all RMOs with CMCs in thermometry and that some assistance should be given to help these TCs/WGs resolve the issues. He suggested setting up minimum requirements of what should be provided when a set of CMCs are submitted for inter-regional review – i.e., some assessment of how well the 9 criteria have been met. (See Action 11.)

Dr Semerjian commented that RMOs reviewing CMCs are working on the assumption that the submitting institutes are designated – he inquired how valid this assumption is. The Chairman responded that the assumption is nearly always valid. Dr Semerjian also mentioned that apparently in some areas similar CMCs were submitted from two institutes in the same country. The Chairman informed him that these cases are known and that this issue is being monitored on an on-going basis.

Dr Semerjian reiterated Dr Schwitz's recommendation that the situation with regard to the CMCs in thermometry needs to be addressed in a centrally coordinated way, adding that there are also problems in the area of photometry and radiometry, especially given the situation that an institute that has capabilities that others do not seems to be penalised for this. The Chairman agreed that this becomes a significant problem when there is no resolution within the technical community. It is hoped that this will be better addressed by the establishment of the Working Groups on CMCs. The process may be assisted if the appropriate JCRB RMO representative also attends these meetings and there is a clear requirement placed on the Working Groups that a resolution must be reached at these meetings.

Prof Kühne noted that, with respect to the thermometry CMCs, most people will be meeting in Chicago in October, so this may be an appropriate occasion to schedule a meeting to resolve outstanding issues. Dr Schwitz informed the Committee that such a meeting is being set up. The Chairman added that both he and Dr Semerjian will be attending this meeting.

The Chairman then referred to the first dot point on page 5 of the EUROMET Report:

- "…Does the MRA allow an NMI or Designated Institute to have CMCs approved and published without its own "corresponding" national standards, e.g. is it sufficient that standards or instruments used to deliver the service be calibrated against the national standards of another participating NMI?"

responding that an NMI does **not** need to hold primary standards, but can hold standards that are traceability to another NMI through calibrations and use these to provide CMCs and to take part in comparisons. The NMI has to maintain those standards and participate, normally, in RMO comparisons.

The Chairman informed the Committee that discussion is taking place with ILAC to clarify that, if an NMI is accredited on the basis of standards traceable to another NMI, then the uncertainties given for the services it provides have to be compatible with the uncertainties obtained from its' traceability. Dr Benyon agreed that ILAC is particularly concerned with the situation where traceability referring to top-level services means that the uncertainties that an NMI provides for accreditation purposes are better than those for their CMCs. (See also the discussion under Agenda Item 13.3.)

Regarding the second dot point on page 5 of the EUROMET Report:

- "Before CMCs are submitted to other RMOs for review, the originating RMO does its own review. Moreover, the intra-RMO review is done on every single entry, while the inter-RMO review is done on a selective basis. How do we act when an intra-RMO report is not available?"

the Chairman stated that the intra-regional RMO report **must** be available with the submission of CMCs for inter-regional review.

Dr Semerjian asked EUROMET how the QS forum approves an NMI's Quality System. Dr Sacconi responded that the oral presentations provided are itemised to explain how each country has built up its system, to indicate specific problems identified and their solutions. There is a precise format for presentations, details of which are available through the *Initiation* website (which will shortly be moved to the EUROMET site). The presentations are made available before each meeting. After the presentations, experts are asked whether all items have been sufficiently addressed, whether they have confidence in the Quality System, and whether the Quality System provides appropriate support for the corresponding CMCs. The opportunity is taken during QS Fora to visit the hosting laboratory to review the application of the Quality System. Thus, it is a formal review and at the end unanimous approval is required. There have been cases where approval has not been granted and more information has been requested.

It is anticipated that there will be periodic major re-presentations/reviews, but the timing of these has not been fixed (it is likely to be 4-6 years). Dr Sacconi noted that there have been complaints that EUROMET's transparency in this area is not necessarily reflected in other regions. The EUROMET approach has helped identify and resolve problems. Dr Benyon added that the QS Forum has also provided the opportunity for other RMOs to make presentations. It has been particular useful in clarifying the relationship between the implementation of a Quality System and the associated CMCs.

Dr Valdés inquired how the QS Forum handles NMIs that are accredited, whether these are simply accepted or whether they also undergo review? Dr Sacconi responded that the same process applies to all participants, independent of the route they have chosen to address Clause 7.3.

6.4 SADCMET: Dr Hengstberger

Dr Hengstberger tabled Document JCRB-9/6(4), summarising the main points. He noted that, in addition to the SADCMET TC-1 Working Groups identified in the Report, there are two new Working Groups
1: WG-QS – to address quality systems issues. The approach will be similar to EUROMET's in having a peer review of the Quality Systems of member NMIs. He noted that the only SADCMET NMI that has undergone peer review of its Quality System to date is NML-CSIR, South Africa. This was undertaken two years ago and included experts from SIM, APMP and EUROMET.
2: WG-DB – to work on the regional database, with assistance from NIST/SIM.

Dr Hengstberger stated that there is a need for a West African regional metrology organisation, and that SADCMET is encouraging Nigeria (which is applying for SADCMET membership) to take the lead here. The ECOWAS (Economic Community of West African States) trading bloc could form the basis for this new RMO.

Dr Schwitz asked for Dr Hengstberger's views on how the north African region should be covered. Dr Hengstberger agreed with the Chairman that political problems have made this difficult and that, due to this, MENAMET had ceased. He informed the Committee that Egypt would like to start an RMO in North Africa, but he was not aware if any progress has been made.

6.5 SIM: Dr Semerjian

Dr Semerjian tabled Document JCRB-9/6(5), summarising the main points.

ACTION 6: SIM is to provide an updated RMO report to the Executive Secretary.

Dr Semerjian noted that Dr Willie May of NIST has provided a report on the work of the CCQM Working Group on CMCs. (NOTE: This is now available to RMO-JCRB representatives as Document JCRB-9/5[3]). He also informed the Committee that SIM has just formed a Task Force on Quality Systems, which he will be chairing. The details are to be discussed at the forthcoming SIM General Assembly.

7. THE JCRB WEBSITE

7.1 Accessing documents

The Exec Secretary informed the Committee that some RMO TC/WG members do not appear to be aware of the existence of the RMO TC/WG section of the JCRB Website. She requested the Committee to provide feedback on improving its usefulness as well as that of the Technical Reviewers' Logbooks and automated-reminder features for CMC reviews.

ACTION 7: RMO-JCRB Representatives to ensure that RMO TC/WG Chairs are informed about the TC/WG section of the JCRB website and to provide feedback on improvements to this and to the new features provided to facilitate the CMC review process.

With respect to Action 32 from the 8th JCRB Meeting Report, Dr Hetherington sought the Committee's views on how information regarding NMIs' approaches to implementing Clause 7.3 of the MRA should be provided on the BIPM website.

ACTION 8: JCRB members to provide views to Dr Hetherington on how information regarding NMIs' approaches to Clause 7.3 should be made available on the BIPM website.

Dr Hengstberger commented that the enhancements to the CMC review process instituted since the 8th JCRB meeting have been useful in the context of a small RMO and that he would appreciate more reminders from the Exec Secretary.

ACTION 9: Exec Secretary to provide more reminders regarding CMC review deadlines as appropriate.

8. INTER-REGIONAL REVIEW OF CMCs

8.1 Acceptable evidence for CMCs during transitional mode of MRA

The Exec Secretary opened the discussion about the status of EUROMET's review of the Thai NMI's Electricity and Magnetism CMCs by tabling Issue #6 from Document JCRB-9/8(1c), Actions arising from the Meeting of RMO TC/WG Chairs in Electricity and Magnetism held at the BIPM in September 2002.

Prof Kühne noted that there are two issues of concern for EUROMET regarding the NIMT CMC submission:
(1) whether sufficient comparisons had been undertaken when the accreditation was given, i.e., is there enough comparison evidence to justify the claimed uncertainties?; and
(2) the fact that, after accreditation, the NMI recently participated in a key comparison in which the quoted uncertainties obtained were a factor of two larger than those given in the "accredited" CMCs. Therefore, the published uncertainties from the results of the key comparison in the KCDB will not match those given for the CMCs. This mismatch may be due to a misunderstanding but needs to be resolved.

Dr Schwitz added that, in this specific case, the timing of events had led to incompatible uncertainties. As well, the APMP intra-regional review report had not been provided with the CMCs.

Mr Jones stated that it is not clear why the case of Thailand is special. Within Europe, there are countries that rely on accreditation and have not necessarily participated in key comparisons – eg.., Hungary, Czech Republic and Slovenia. What APMP seeks is clarification of what is required of Thailand to satisfy the EUROMET reviewers. He noted that, as a DKD accredited laboratory, NIMT's results would normally have been accepted in Europe but because of the MRA they are not accepted.

The Chairman noted that there is a specific issue to be resolved with respect to the Thai laboratory, but that there are other more general issues arising out of this that need to be addressed. One of the reasons for creating the CIPM MRA was that ILAC needs worldwide recognition of calibration certificates, so links between the CIPM and ILAC MRAs and compatibility between the MRAs is necessary. Dr Benyon added that more links are needed between the two MRAs so that accreditors have a consistent understanding of what is meant when they accredit an NMI's capabilities.

Prof Kühne stated that the accreditation of NMIs' quality systems does not replace the need to participate in key comparisons.

Mr Jones inquired whether NIMT's CMCs will be accepted if their uncertainty claims are satisfied. Dr Schwitz responded that what is required is evidence from comparisons.

ACTION 10: The JCRB strongly urges the EUROMET and APMP representatives to the JCRB to work together to resolve the issues relating to Thailand's E&M CMCs.

Dr Semerjian inquired whether this was only a transition period issue due to the fact that, in this case, the only basis for the claimed uncertainties is through traceability to another NMI? The Chairman responded that the

issue is how well the NMI has performed in internal comparisons compared with the uncertainties given in its accreditation. The Chairman added that uncertainties in key comparisons and CMCs must be compatible.

Dr Semerjian pointed out that this case illustrates the fact that accreditation does not answer all questions about the capabilities of an NMI. Dr Seta agreed, adding that, in his view, there was some lack of transparency in this specific situation with respect to the evidence provided by NIMT.

Dr Sacconi suggested that this case highlights a weak point in the MRA in that it allows participation not only by "real" NMIs but also by accredited laboratories at the next level. Dr Hengstberger responded that these laboratories are also "real" NMIs, since they have the legal status of providing national measurement standards for their country. Therefore, they are not the same as, for example, accredited commercial laboratories.

The Exec Secretary then tabled Issue #7 from Document JCRB-9/8(1c) in which the EM TC/WG RMO Chairs have noted for the information/advice of the JCRB that, due to various constraints, NMIs would opt to undertake regional *bilateral* comparisons to meet the requirements of the CIPM MRA. The Chairman stated that there is no problem with this, since a properly conducted regional bilateral comparison following the guidelines has the same status as a key comparison.

8.1A Clarification of Criteria given in Document JCRB-8/13(1b)

Mr Jones sought clarification of the Criteria given in Document JCRB-8/13(1b). He highlighted Item 3 – how will a new NMI satisfy these requirements? The burden of this is currently on the TC/WG Chairs – can the JCRB provide some guidance?

The Chairman stated that it is not possible to quantify the criteria. Dr Semerjian agreed that it is difficult to be more proscriptive. The criteria are to be used to judge the acceptability of another laboratory's CMC claims as a reminder or check list only. They are also a reminder that the judgement should not be based on a single issue, and that indeed more emphasis may be required on some items when evaluating a laboratory with which the expert is less familiar.

Mr Jones pointed out that, for a new NMI there can be conflict in what one RMO considers adequate evidence compared with another RMO. Dr Semerjian responded that part of the knowledge of a laboratory is obtained through the exchange of artefacts, knowledge of the staff, etc, but specific points that must be taken into account are difficult to define *a priori*. As an example, in the case of NIMT, Thailand, if NMIJ had stated that they have a lot of experience with the laboratory this could be considered very helpful, but it is a subjective judgement.

Mr Jones concluded that perhaps the important point is that, when delays occur in reviews due to matters of interpretation of how well the criteria have been addressed, there needs to be some clear method of resolution and that the TC/WG Chairs are not left to resolve this in isolation. Dr Schwitz responded that it is very seldom that the judgement relies on one person alone and that the TC/WG Chairs are usually very experienced. What would be helpful to the TC/WG Chairs in other RMOs when trying to make this judgement is if the report provided when the CMCs are submitted for inter-regional review addresses how well the criteria have been addressed, explaining why points are not addressed and when they will be.

Dr Semerjian noted that the Working Group concept may help address some of these issues. Even if they are not addressed directly in the report, at least clarification can be sought at these meetings.

Mr Jones asked whether such a report is currently provided when CMCs are submitted for inter-regional review. The Chairman responded that it is implicit that the MRA's requirements should be addressed when CMCs are submitted for inter-regional review. Perhaps a checklist should be included. Mr Jones noted the amount of additional work this would require and suggested that the meetings of TC/WG Chairs could be asked to decide how best to share the information. He sought agreement that the key message is that there is still significant flexibility in the interpretation of the criteria. Dr Schwitz pointed out that all that is required is a summary of the review that has already been undertaken, and that this would serve to underpin the work already done.

ACTION 11: RMOs must provide a one or two page summary of the intra-regional review report, providing an evaluation of how well the 9 criteria in Document JCRB-8/13(1b) have been addressed *with each submission* of CMCs for inter-regional review.

8.2 Process for review of "single-line" CMCs

The Exec Secretary tabled Issue #2 from Document JCRB-9/8(1c), the question of the review procedure for "single-line" CMCs or small modifications to published CMCs. The Chairman stated that in these cases the CMCs would still need to under go the whole process. However he added that the proposed meetings of RMO TC/WG experts should be an effective way of handling this.

8.3 Statement regarding IAEA CMCs

The Chairman stated that, during the transition period, it is acceptable to have the IAEA CMCs in the database pending the finalisation of the Quality System. He then proposed that the requested deadline to establish the Agency's Quality System be accepted. The Committee agreed.

Prof Wallard suggested that, since the Agency is not part of an RMO, perhaps one of the RMOs could include them in their "QS Forum" process. (IRMM goes through the EUROMET process.) The Chairman agreed, adding that it would clearly be simplest for IAEA to undergo the EUROMET process but inquired whether there were any different views. Dr Hengstberger expressed his support for this approach.

ACTION 12: The Chairman will write to IAEA encouraging it, once it has established its Quality System, to consider having it evaluated through one of the RMO QS processes. The letter will inform the Agency that EUROMET is willing for it to participate in its QS Forum process. In the meantime the JCRB approves the requested deadline by which the Agency will have established its Quality System.

8.4 CC[5] Working Groups on CMCs

Dr Semerjian tabled the draft Terms of Reference for the proposed *Working Groups on CMCs* for comment.

NEW ACTION 13: JCRB Committee members are to review the Draft Terms of Reference for the Working Groups on CMCs (Document JCRB-9/8[4-rev]) and provide final comments to the Exec Secretary by *25 November 2002*.

9. KEY COMPARISONS

The Chairman highlighted the change in the flow chart regarding the procedures for undertaking a key comparison (Document JCRB-9/9). The modification has been made to the fourth box from the top in the right-hand column. This previously stated that results of key comparisons were to be submitted to Consultative Committees. It now states that they are to be submitted to the CC Working Groups on Key Comparisons (or equivalent). The flowchart will be posted on the KCDB website.

9.1 Registration of new key comparisons

The Exec Secretary tabled the template (Document JCRB-9/9[1]) for registration of CIPM and RMO key, supplementary and bilateral comparisons. This is proposed to be used by Consultative Committees to register such comparisons.

ACTION 14: RMO-JCRB Representatives are to send the template for registration of CIPM and RMO key, supplementary and bilateral comparisons to their RMO TC/WG Chairs for information.

9.2 Impact of key comparison results on CMC claims

The Chairman raised the issue of the chain of responsibility in terms of monitoring when the results of key comparisons impact upon published CMC claims. [This was also included as Issue #1 in Document JCRB-9/8(1c).] He recommended that the hierarchy of responsibility is: the NMI whose CMC claims are affected, the RMO to which that NMI belongs, and then other RMOs.

Dr Hetherington stated that EUROMET agreed that this is primarily the responsibility of the relevant NMI. Dr Semerjian noted that it would form part of the responsibilities of the new Working Groups on CMCs to point out these discrepancies. However, he agreed that it is the responsibility of the NMI to take the appropriate action. Dr Benyon pointed out that, for NMIs with a Quality System in place, this on-going monitoring is part of the System. Dr Sacconi commented that one of the regional outputs of the QS Forum is whether each NMI has a written procedure for continuous re-alignment of results of key comparisons and TC/WG evaluations of CMC claims.

[5] See Footnote 2.

The Chairman stated that the brief report of this discussion in the Meeting Report should be used to inform RMO TC/WG experts of the JCRB view on this issue.

ACTION 15: RMO-JCRB Representatives are to refer RMO TC/WG experts to the discussion under Agenda Item 9.2 in the Report of the 9th JCRB Meeting regarding the responsibility for taking action when key comparisons results impact upon published CMC claims.

Dr Korostin raised the issue that information about key comparisons is currently spread among a number of documents and suggested that a single document be created that brought together all the relevant information. The Chairman clarified that this referred to extracts from the MRA, guidelines for key comparisons, the form for registering key comparisons, etc.

Dr Benyon pointed out that it is potentially dangerous to have extracts from other documents put together into a new document, due to the possibility of changes to the original documents. He suggested that the relevant references could instead be collated in one document to tell users where to obtain information. The Chairman agreed and added that JCRB members should encourage RMO TC/WG experts to read the documents that are available.

ACTION 16: The JCRB Exec Secretary is to create a new document which collates references to all other procedural documents regarding key, supplementary and bilateral comparisons and other relevant information to facilitate access to existing guidelines by RMO TC/WG experts.

ACTION 17: RMO representatives to the JCRB are to encourage RMO TC/WG experts to refer to the existing guidelines on comparison procedures, etc.

10. INTER-REGIONAL HARMONIZATION OF QUALITY SYSTEM REVIEWS

10.1 Updated report of *ad-hoc* working group

Dr Hetherington presented the revised Report of the Ad-hoc Working Group for comment [Document JCRB-9/10(1)]. The amendments proposed by the Committee were incorporated and a new version is now available – Document JCRB-9/10(1_rev).

Dr Benyon referred to the second bullet point on page 5 and inquired why signatories to the ILAC MRA need to provide assessors' details. Dr Hetherington inquired in turn whether there was any reason not to provide these details. The Chairman added that, if the NMI customer is willing to have these names divulged – an issue that should be addressed before the process of accreditation begins – then there seems to be no reason why the accreditation body should refuse to provide these details. It provides more confidence for the NMI that the assessment has been done appropriately, so NMIs should be encouraged to provide these details.

Dr Semerjian asked whether this is a problem for accreditation bodies. Dr Benyon responded that there is a variation in approaches to this among accreditation bodies. Dr Schwitz then asked whether there is an ILAC policy on transparency of experts, noting that the CIPM MRA states that reviewers names be available. Dr Benyon responded that the information is provided in the reports of the assessments and in the evaluation of the review of each accreditation body, but this is not public so the use made of it depends on the laboratory. There is an ILAC policy that each accreditation body must have a system of providing details of the qualifications of the experts.

Dr Semerjian stated that there should be a comparable transparency. Prof Kühne added that the objective is to improve confidence. The Chairman proposed that this be addressed by the Joint BIPM/ILAC Working Group.

ACTION 18: The Joint BIPM/ILAC Working Group (see Action 22) is to address the issue of consistency between the CIPM and ILAC MRAs regarding the provision of details of NMI assessors.

The Chairman noted that this document is not yet ready to be presented to the CIPM.

ACTION 19: The Document JCRB-9/10(1_rev) is to be taken back by the JCRB-RMO representatives for discussion within the RMOs. Comments are to be brought to the next JCRB meeting so that the document can be finalised as a JCRB document at that time.

11. NOTIFICATION OF DESIGNATED INSTITUTES

Dr Semerjian sought clarification on the formal process for designating an institute. The Chairman responded that the Signatory institute in the MRA for a particular country is responsible for informing the Director of the BIPM officially which institutes from that country are to be designated and therefore to be included in Appendix A of the MRA. Dr Valdés inquired whether every institute that wishes to participate in the MRA is obliged to address this through their recognised institute. The Chairman agreed that he can only accept this information from the signatory institute.

The Chairman informed the Committee that discussions are under way within the CCQM regarding the status of CRM providers and the decision is that sub-contracting is not acceptable. Dr Semerjian added that there did not seem to be any point in having a sub-contracted institute. However he expressed his concern that in the Laboratory Medicine area there are commercial companies that make money by providing standards for cholesterol tests, etc, and these would like to increase their credibility by being able to claim that they are designated institutes.

The Chairman concluded the discussion by re-stating that the authority to designate institutes rests with the government or official body within the country and that this is a purely internal matter for each country.

12. REVIEW OF MRA DUE FOR 2003: END OF TRANSITION PERIOD OF MRA – INTERPRETATION OF MRA TEXT

The Chairman opened the discussion regarding Document JCRB-8/13(1), "Interpretation of Paragraph 11.3 of the CIPM MRA concerning the end of the transition period". He informed the Committee that this had been tabled at the Directors' Meeting in April and that there had been objections raised to Clauses J and H from the NIST and PTB.

Prof Kühne clarified his understanding that the objection from PTB was that it *appeared* as if NMIs using approach Clause 7.3(b) should have different requirements placed on them, and that in fact the requirements should be the same no matter which approach was adopted.

It was agreed that all references to Clause 7.3 would remove any distinctions between (a) or (b). The document was re-drafted and has become **Document JCRB-8/13(1_rev).**

The Chairman then opened the discussion on Document JCRB-9/12, "End of transition period of CIPM MRA – review of published CMCs". The following changes were agreed and the Document revised accordingly:

- To remove the implication that there is a difference between the applicability of the 9 criteria before and after the end of the transition period.
- To Highlight Criteria 1 and 8, stating that
  - CMCs not supported by a Quality System after the end of the transition period will need to be withdrawn unless an extension is sought and granted; and that
  - as part of its on-going processes, the new WG on CMCs is expected to review the results of each key comparison and make a report on the implications with regard to the CMCs of the NMIs.
- Also to consider the fact that some CMCs currently published are supported by "provisional" evidence and that this will need to be addressed after the end of the transition period. It was agreed that, if stronger evidence does not become available, the CMCs remain in the KCDB until such evidence is available. However, if relevant key/supplementary comparisons are undertaken that support particular CMCs and countries choose not to participate, then the "provisional" evidence supporting their CMCs is no longer valid and the CMCs must be withdrawn. It is the responsibility of the RMOs to ensure that NMIs participate in the appropriate key/supplementary comparisons.

Dr Seta inquired about the relationship between Appendices B and C, suggesting that information should be provided about which key comparison covers which CMCs. The Chairman responded that this is difficult in view of the large number of key comparisons. Dr Semerjian noted that the CCQM recommends that each key comparison has a statement at the end identifying the areas that the comparison covers.

ACTION 20: The Consultative Committees are to be asked to formally consider providing information about the coverage of key comparison results, e.g., in relation to which CMCs are supported by the results, etc.

13. OTHER BUSINESS

13.1 Publicity

The Executive Secretary tabled Document JCRB-9/13(1a), in which approaches in terms of promoting participation in the Metre Convention and the CIPM MRA are considered in the context of the level of awareness of countries regarding metrology and related activities. She referred to Document JCRB-9/13(1b), a letter from the BIPM Director to NMI Directors of States that are not yet members of the Metre Treaty or Associates of the CGPM. She also made reference to the new Joint Committee on coordination of assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS), for which the draft Terms of Reference and reports from the first two meetings are provided for the information of the JCRB as Documents JCRB-13(2a), (2b) and (2c).

The Chairman then outlined the background to the drafting of the Letter, and requested Committee members to review this and provide feedback to him.

Dr Semerjian suggested that it would be helpful to articulate existing metrology programs for these countries and perhaps provide a summary of references to existing documents (e.g., the KPMG report, impact studies and other documents such as those that the NIST has produced). He added that the efforts of Dr Thomas at the PittCon meeting and the BIPM presence there was a good means of developing grassroots awareness. He suggested that two-three major exhibitions/conferences should be targeted per year for this type of exposure, and that perhaps local people could be trained to provide demonstrations of the KCDB rather than Dr Thomas/BIPM staff having to undertake these activities each time.

Dr Hengstberger added that it was important to target industry representatives since they are in a position to drive participation by governments. He added that this type of approach is being undertaken by some of the RMOs and that the activities of the JCDCMAS will be helpful in this connection. He noted that many of the less developed countries are in fact aware of the benefits of participating in international activities of this type.

Prof Wallard then summarised the work to date of the JCDCMAS and highlighted the specific actions arising from the 1st meeting in Stockholm on September 28. The Exec Secretary informed the Committee that comments on the JCDCMAS's draft Terms of Reference were due by Friday 4 October.

ACTION 21: JCRB-RMO Representatives to review the draft Terms of Reference of the JCDCMAS and provide comments to the JCRB Exec Secretary.

13.3 BIPM-ILAC MoU and related issues

Documents JCRB-9/13(3a) and (3ai) were tabled, in which criteria for NMI assessors/reviewers were proposed and APMP's comments to these were provided. Dr Benyon informed the Committee that ILAC Document 11 (1998) provides a similar list of criteria. After further discussion, it was agreed that there was no necessity for the JCRB document and it was **withdrawn**. Any further discussion on this issue will be taken up within the new Joint BIPM/ILAC Working Group (see Action 22).

(Note that Documents JCRB-13(3b) and (3c) were included for the information of the Committee and are lists of NMI assessors provided by the CENAM Director-General.)

The Chairman then invited Prof Wallard to present to the Committee the paper he delivered to the ILAC General Assembly on September 26 2002 (Document JCRB-9/13[3e]). Prof Wallard's presentation highlighted the two proposals he had made to ILAC [which were also given separately in Document JCRB-9/13(3d)]:

1. "For a particular quantity, an accredited laboratory will not have uncertainties smaller than those of the NMI from which it claims traceability. This would require assessors to ask specific questions about traceability and use the BIPM database to identify the CMC from the NMI concerned. In addition common service terminology would be necessary.
2. In the case that an NMI is accredited and takes traceability from another NMI, often from within the same Regional Metrology Organisation, then it should not have CMCs smaller than those that can be justified by the comparisons linking it to the other NMI. This again requires accrediting bodies and assessors to identify traceability links and the associated uncertainties."

Dr Benyon suggested that actions could be initiated by the JCRB to obtain convergence on the question of CMCs vs BMCs. He added that this would be a practical way of addressing Proposal (1), where problems are occurring because certificates are being accepted with uncertainties that are lower than those from the NMI's

CMCs. Although the NMIs are not responsible for the use that customers make of results, there is an obligation to explain traceability to accredited laboratories so that they know to look for such discrepancies.

The Chairman stated that it is understood that NMIs can have better capabilities than those in their CMCs, but this is outside the realm of the MRA. The question is what is the status of such certificates with respect to those of other NMIs. The second question is can an NMI claim uncertainties smaller than those obtained through a key comparison.

Dr Schwitz agreed that, if an NMI provides a special service, e.g, providing services to another NMI to enable it to then provide CMCs, this should be open and transparent but should not be considered the same as an ordinary CMC. The Chairman added that if an NMI uses this means to justify CMCs, it has to fit into the CIPM MRA procedures.

Prof Kühne stated that there is the risk of losing equivalence between primary standards. If uncertainties are smaller than degrees of equivalence, the relationship to the SI could be lost.

Dr Benyon noted that what is needed is a practical and unambiguous route to support traceability that can be used at the accreditation level, i.e., there is the need to distinguish between certificates that are consistent with CMCs and those that are not. Prof Kühne suggested that NMIs could issue two types of certificates: one backed up by CMC claims could be used for traceability purposes in the ILAC scheme; the other, based on the uncertainties from an NMI's primary standards, could be used only in special cases. Dr Benyon agreed that this would help assessors. However, the second type of certificate does not exclude support of traceability.

The Chairman asked to what extent the NMIs present issue certificates to other NMIs that are very different from their CMCs. Dr Semerjian responded that NIST has a declaration of equivalence with NMi, the Netherlands, that precedes the CIPM MRA. The uncertainties in this have to be at a higher level than for NIST's normal reference materials. In addition, in the case of certain laboratories that act as the primary laboratory for the military, etc, NIST may provide calibrations with better uncertainties because the measurements have been undertaken differently, e.g., with more repeats, over a longer period of time, or using additional independent techniques to improve the measurement uncertainty, etc. He suggested that if an NMI issues a calibration report with uncertainties that are not reflecting their CMCs, the NMI should explain the additional measures taken to achieve these different uncertainties. The Chairman asked whether these should still be compatible with the results of key comparisons. Dr Semerjian responded that this is debatable. At NIST, key comparison measurements are undertaken like other measurements, not at the "research project" level. However, this may not be true in other NMIs. The definition of the CMC is that it is meant to reflect "normal" procedure. However, a customer may make a special request.

Dr Benyon noted that the confidence in CMCs comes from the fact that there is a review process, and that most of the services that accredited laboratories need will come from CMCs. However, accredited laboratories need to know which certificates are covered by CMCs and which are not, and if not, whether they are covered by a key comparison. The Chairman asked the Committee whether it is the metrological community that should provide the answer or whether this should be addressed at the NMI-level. Prof Kühne responded that this is an issue that should be resolved by the metrology community.

Prof Kühne pointed out that the low frequency of repetition of key comparisons means that some NMI's calibration capabilities may significantly improve before this is reflected in a new key comparison.

Dr Schwitz noted that the issue is the next level of services that are "ordinarily available" but are provided between NMIs. Ing Mussio pointed out that when a special calibration is requested by a small NMI of a larger NMI this forms part of the review report accompanying the submitted CMCs. Dr Benyon responded that the problem is not when the certificate goes to another NMI, since it is within the community and understands the context, but when the certificate goes to, say, a commercial company outside the region. This can become a technical barrier when the calibration is not justified by CMCs. Dr Semerjian reiterated that, since this case is outside the framework of the MRA, an NMI claiming less uncertainty should be required to provide at least an uncertainty analysis that discusses why the uncertainty of this particular measurement is less than that in the CMC.

Prof Kühne proposed that the RMO TC/WG in the region in which the calibration laboratory operates could discuss the situation with the other RMO TC/WG in the region where the traceability originates.

Dr Benyon pointed out that, in the case where the uncertainties claimed for a service are not consistent with the CMCs and the uncertainties are being used to support an accreditation, then additional information **would be needed** to support the smaller uncertainties. This would ensure that the certificate provider knows that there is a cost to them in claiming the smaller uncertainty. He repeated that accreditors are not questioning the services provided between NMIs. However, if this is a service between NMIs used in the context of accreditation then such information would also be required. He then proposed that an *ad hoc* joint working group be created to draft the appropriate words to be inserted into the CIPM-ILAC MoU.

Dr Hengstberger supported the idea of setting up a joint Working Group to resolve this. (See Action 22.)

Dr Semerjian stated that the main issue is to distinguish between certificates consistent within the MRA framework and those that are not. He suggested that a simple statement could be included on the certificate stating that the uncertainties are smaller than those in the KCDB for the following reasons. This would inform the accreditor that this is a different situation and they can then decide how to deal with it.

Dr Hetherington agreed with the Chairman that firstly the size of the problem should be determined. Ing Mussio supported the suggestion of determining how many certificates this affects. He added that if there are only a few, they can be treated as exceptions.

The Chairman concluded that, with respect to the issue of smaller uncertainties from special calibrations, NMIs are clearly free to do this at any time but have to make it clear whether their certificates are supported in the MRA. It is the NMI's prerogative to provide special services to commercial companies, etc.

ACTION 22: A Joint BIPM-ILAC Working Group will be established to resolve the issues raised concerning coherence between the CIPM and ILAC MRAs. Prof Wallard is to to take the lead in this, and each RMO is requested to nominate one representative to provide the metrology representation. Prof Wallard is to determine a suitable venue for the initial meeting at which the issues will be identified. The outcomes are to be brought back to the next JCRB meeting.

13.4 Brief Report from ILAC

Dr Benyon tabled two ILAC documents which became Documents JCRB-9/13(4a) and (4b). He noted that if coherent traceability to the SI is needed by users then the appropriate links need to be made between the CIPM and ILAC MRAs. With reference to Document JCRB-9/13(4b), Dr Benyon highlighted the suggestion that NMIs be encouraged to participate in "calibration"-level comparisons to reinforce the direct link between key comparisons and "industrial" comparisons. The Chairman responded that this does take place already in certain areas, e.g., IRMM's activities, but that more of such activities would be an enormous load on NMIs. Dr Benyon responded that NMIs be encouraged only to consider undertaking this activity.

The Chairman noted that there should not be the perception that only capabilities in the MRA have credibility. Dr Benyon agreed, adding that it is a matter of how confidence is transmitted to the end-user for capabilities that are not in the MRA.

Dr Valdés commented that this is a question of who assures traceability. Dr Semerjian informed the Committee that NIST has decided that it is not its job to decide who assures traceability, but this is left up to the regulatory body or customer to decide. NMIs can only assure the presence of national standards that can provide traceability. The Chairman agreed, noting that traceability of laboratory medicine provided a good example, where the EU Directive has obliged industry to determine how they will assure traceability.

13.5 Proposed Working Group on Uncertainty Analysis

The Chairman invited Dr Semerjian to raise his proposal. Dr Semerjian noted that uncertainty analyses are being undertaken by different CCs in different ways, with many of the same issues coming up. He suggested that there is a need for an advisory group to the JCRB on uncertainty issues, to provide guidance to the CCs and harmonise these efforts. He noted that there had been a recent meeting on this subject at NPL, and that another is planned at PTB in December. It is not clear who is invited to these meetings and how they are coordinated. He suggested that the Advisory Group include statisticians *and* metrologists who have a good understanding of statistical issues. He noted that the Chairman has set up a small group to help in this regard but that the membership needs to be broader with more open selection from the RMOs, etc. The Chairman informed the Committee that the membership of the informal advisory group to which Dr Semerjian referred had been based on representatives of the Joint Committee on Guides in Metrology. He accepted the criticism that it does not include a professional

statistician. However, he considered that this is not task of the JCRB, but he will look again at the composition of the existing group and may formalise it, rather than creating a new one.

ACTION 23: The Director of BIPM is to re-consider the composition of the informal advisory group on uncertainty analysis with a view to formalising and broadening the membership.

Dr Hengstberger stated that the existing group does not have enough profile to respond to the needs of the CCs. Dr Semerjian added that the group should respond to the JCRB's needs, since the JCRB is the meeting point for the concerns of the CCs. The Chairman responded that it is not the JCRB that handles the concerns of the CCs but the CIPM. Dr Semerjian inquired which body resolves issues such as the stalled review of CMCs in thermometry. The Chairman responded that, again, this is the task of the CIPM.

Dr Semerjian raised the case where appropriate expertise does not exist within an RMO to evaluate a CMC. He asked for confirmation that, in such cases, the CMC evaluation is referred to another RMO. The Chairman agreed. Dr Semerjian then informed the Committee that, based on this understanding, SIM had asked another RMO to evaluate some CMCs, but that the other RMO had sent the CMCs back saying that SIM has to take responsibility for them. The Chairman responded that this is not correct and that the correct process is already taking place in the case of CMCs from SADCMET that are being *intra*-regionally reviewed by APMP. Dr Schwitz commented that this is not the same situation in that SADCMET had asked to outsource its CMCs to APMP, with the consequence that APMP is excluded from participating in the inter-regional review. In the case raised by Dr Semerjian, there is only one RMO that can undertake both the intra and inter-regional review. The Chairman responded that in such a case the CMCs can only undergo one review but this should be considered an exception.

ACTION 24: Dr Semerjian is to re-submit SIM's CMCs to the relevant external RMO in the special case where only one external NMI from this RMO is in a position to review them. He is to inform the external RMO of the JCRB guidelines that, in this special case, only one review is undertaken of these CMCs.

14. DATE AND PLACE OF NEXT MEETING

The Chairman invited the Chairman of APMP to inform the Committee of the dates and venue for the 10th JCRB Meeting. Dr Imai stated that the 10th JCRB meeting is to be held on 3-4 March (Monday-Tuesday) in Tsukuba, Japan. In addition to the JCRB Meeting, there will be a one-day seminar on Wednesday 5th March, with the morning sessions targeted at the NMI-level with presentations on the global MRA, etc, and the afternoons sessions open for all AIST members, with presentations on subjects such as reference materials and biomeasurement.

15. CLOSE OF MEETING

The Chairman then closed the meeting and thanked all participants for their contributions.

REPORT OF 10th JCRB MEETING, 3-4 MARCH 2003 [NMIJ, JAPAN]

1. OPENING AND WELCOME BY THE CHAIRMAN

The JCRB Chairman and Dr Imai, Chairman of APMP, welcomed those present. Following general introductions, the Chairman requested comments on the Draft Agenda. Drawing attention to the Terms of Reference of the JCRB (Appendix E of the CIPM MRA), he noted that the future operation of the JCRB would be discussed further under Agenda Item 12, "Date and Place of Next Meeting". [The Final Agenda is given in Appendix 1 incorporating all modifications, and providing references for all working documents.] **The Chairman also noted that the Annual Report for 2002 (reporting on the two preceding meetings) would be sent out to the Committee shortly after the 10th JCRB Meeting.**

ACTION 1: JCRB Exec Secretary is to send the Committee the Annual JCRB Report.

2. MATTERS ARISING

The Chairman referred to Document JCRB-10/2. He invited the JCRB Executive Secretary to review outstanding matters. The following specific Actions were discussed.

Action 1: The Exec Secretary requested information regarding RMO Yearly calendars – Dr Castelazo noted that these are included with each RMO report. However, please see Appendix 3 for a summary of available information.

ACTION 2: RMO-JCRB Representatives are asked to review Appendix 3 of the Report of the 10th JCRB Meeting and inform the JCRB Executive Secretary at which events attendance by senior BIPM staff is sought.

Action 4: The Chairman informed the Committee of the CIPM view that the Working Groups on CMCs should not be undertaken within the Consultative Committees (CCs), but that meetings should be encouraged to take place at the same time as CC Meetings. Dr Semerjian suggested that the subject be discussed further under Agenda Item 6.3.

Action 8: Mr Hetherington stated that he has not received any feedback on how information about NMIs' approaches to Clause 7.3 should be made available on the BIPM website. He questioned the necessity of providing this and it was agreed that there was no significant added value.

Action 10: **The Chairman urged APMP and EUROMET to resolve the review of the Thai NMI's Electricity and Magnetism CMCs during this meeting.**

Action 16: The Exec Secretary demonstrated the draft version of the flowchart being developed to provide links to procedural documents regarding key, supplementary and bilateral comparisons and other relevant information. **The intention is to make this accessible on the website by mid-2003.**

Dr Semerjian requested that a deadline be provided before each JCRB meeting for the submission of documents, to provide RMO-JCRB representatives with time to review these before the meeting.

ACTION 3: JCRB documents that are to be tabled at each meeting are to be submitted to the Executive Secretary *no later than one week in advance of the meeting* so that they can be made available on the JCRB webpage.

3. REPORT BY THE CHAIRMAN

The Chairman reminded the Committee that the end of the transition period of the CIPM MRA is approaching. A formal document is being prepared that draws together the outcomes from the last four years of operation of the JCRB. This will be sent to the Committee well in advance of next JCRB meeting and will also be posted on the website.

ACTION 4: JCRB Chairman and Exec Secretary are to prepare the CIPM Report on the JCRB and to forward this to the Committee and post it on the JCRB website.

The Chairman expressed his concern that not many CMCs have been published since the last JCRB Meeting (see Report by the KCDB Coordinator [Document JCRB-10/4]. In the field of Thermometry, in fact, progress has been completely stalled and it is essential that the problems be resolved.

He informed the Committee of a request for a JCRB policy statement on the appropriate use of the Statement referring to the CIPM MRA on NMIs' calibration certificates. **The Committee agreed that the Statement referencing the CIPM MRA should only be included on calibration certificates for NMIs' CMCs that are published in Appendix C of the KCDB.**

Finally, he informed the Committee that a letter has been sent to NMI Directors seeking nominations for a replacement for Dr Samuel in the role of JCRB Executive Secretary. He added that the scope of the position is now somewhat broader than when Dr Samuel began. Expressions of interest have been requested by the end of March 2003.

Dr Semerjian requested that the Committee's thanks to Dr Samuel be noted in the Meeting Report. This is so noted.

4. KCDB REPORT

In the absence of Dr Claudine Thomas, the KCDB Coordinator, the Chairman read out the KCDB Report (Document JCRB-10/4).

The Chairman highlighted the recommendation by Dr Thomas, that "RMOs submit subsets of CMCs as soon as they are ready, rather than waiting for the whole set of CMCs covering a Metrology area to be drawn up."

He also expressed his concern that, on some occasions, technical experts become overly obsessed with details and thereby hold up the finalisation of Key Comparisons. Although not specifically within the scope of the JCRB, he requested this concern to be taken back to the RMOs.

Dr Castelazo informed the Committee that the SIM Working Group on Length has requested that the reporting process for Key Comparisons be simplified. Currently, the drawing up of the detailed comparison report takes a lot of time and the Comparison Coordinator is often not very skilled in preparing the document. Perhaps the report could just consist of Excel spreadsheets of the comparison results with, if necessary, a covering document accompanying this.

The Chairman invited comments from the Committee on how to address this request.

Dr Semerjian stated that the NIST E&M Group is concerned that Key Comparison reports are now not only expected to provide results but to also make comment on related CMCs. On the one hand, the laboratories are being asked to produce the reports in a timely way but at the same time more work is being asked from the Working Groups and pilot laboratories. The Chairman responded that in his view it is the responsibility of the pertinent NMI to follow up when the results of a Key Comparison impact on its CMC claims and it is only when this does not occur that it becomes the responsibility of the RMO. This is not a task that should be asked of the Working Groups or pilot laboratories. Dr Semerjian replied that he had thought this was the driver for setting up the Working Groups on CMCs. It was agreed that this issue would be re-visited under Agenda Item 6.3.

For information, Dr Kaarls noted that there is an *Ad Hoc* Working Group on Viscosity that has undertaken a Key Comparison, the results of which are currently in draft B form.

Prof Kühne asked whether details were available on the KCDB on how links were made between CIPM and RMO key comparisons. The Chairman agreed that relevant documents should be accessible. Dr Semerjian proposed that a general guidance document, which used examples showing its application, would be useful.

ACTION 5: A general guidance document describing how linkages have been made between CIPM and RMO key comparisons is to be provided on the KCDB, using existing technical procedures on linkages as examples.

Some discussion took place on the value of trying to track visitors to the site. It was noted that this would be provided as an optional request when visitors subscribe to the new KCDB Newsletter.

The Chairman noted that Dr Thomas will be participating in the annual PittCon Conference shortly, and thanked NIST for its generosity again in providing space in its booth for the BIPM.

The JCRB expressed its appreciation of the ongoing excellent work of the KCDB Coordinator and her staff.

5. RMO REPORTS

5.1 APMP

Dr Imai tabled Document JCRB-9/5(1), summarising the main points. He informed the Committee that on 20 May 2003, World Metrology Day, NMIJ/AIST would be holding a ceremony to celebrate its Centenary, at which the Nobel Prize winner in Chemistry, Dr Koichi Tanaka, will make a presentation.

The Chairman congratulated NMIJ/AIST and encouraged other NMIs to use such high profile speakers when possible to highlight the importance of metrology, in particular with younger people. He noted the increasing number of APMP members participating in the CIPM MRA, and highlighted the important role that the RMOs play in encouraging this.

Dr Imai informed the Committee that, at the request of the Director of the Sri Lankan NMI, he and the APMP Executive Secretary, Dr Usuda, had visited Sri Lanka in February 2003 to meet with the Secretary of the Ministry of Commerce and Consumer Affairs. It had been a very successful meeting in terms of highlighting the importance of metrology. A similar approach had also been made to the relevant Vietnamese government officials during the APMP General Assembly meetings in Hanoi in November 2002.

Dr Semerjian commented that participation in the CIPM MRA has been discussed within SIM, which has a large number of members but many represent quite small countries. There is general interest from the Caribbean grouping CARIMET, for example, but these countries cannot afford to join on an individual island basis. He requested advice from the Chairman on group membership in such cases.

The Chairman responded that he understood that any single country within CARIMET would never be responsible for more than one metrological quantity, so there is a distributed metrological infrastructure with the ensemble representing a distributed NMI. The question of joint Associate membership for such a case is being considered. It is important to be aware that each Associate is not to submit more than one set of CMCs in a particular field.

Dr Semerjian informed the Chairman that these States are formally establishing an economic entity called CARICOM. Since the text of Resolution 3 uses the word “economy”, it is a matter of how this is interpreted. The Chairman agreed that this should be approached with an open and flexible mind. He undertook to look into the *extension* of the interpretation of Resolution 3, to be considered at the 22nd CGPM.

ACTION 6: The Chairman is to recommend to the 22nd CGPM that the interpretation of the term “Economy” in Resolution 3 of the 21st CGPM be extended to include economic “entities” such as CARICOM.

Dr Hengstberger commented that the work of the JCDCMAS is also very important in providing a coherent and consistent message about the elements of technical infrastructure to politicians. Awareness seminars are held in the SADC region to inform politicians of the infrastructure elements and of existing structures, and a joint ISO, ILAC and OIML seminar/workshop is to be held shortly in the SADC region. SADCMET members are seriously considering becoming Associates of the CGPM and will do so when they have established the appropriate infrastructure. What is important at this stage is to create awareness and the Letter from the Director of the BIPM, sent out in January 2003, helps with this.

Dr Castelazo noted that a joint SIM-APMP proposal on Quality Systems has been approved for APEC funding, with two Workshops to be held, one in Canada and one in Malaysia.

5.2 COOMET

Dr Belotserkovskiy tabled Document JCRB-9/5(2) and Appendices 1-9 given in Documents JCRB-9/5(2a-i), summarising the main points.

The Chairman asked what new elements there are in the Organisational Structure. Dr Belotserkovskiy noted the Quality Forum and the Measurement Standards Joint Committee. Dr Imai asked about the function of the Quality Forum and it was explained that COOMET's Quality Forum undertakes a similar function to that of EUROMET.

5.3 EUROMET

Mr Hetherington tabled Document JCRB-9/5(3), summarising all Sections except Section 6, which was covered by Dr Sacconi. Mr Hetherington noted that at the meeting with APMP to discuss the Thai CMCs, he hoped to also discuss issues arising with chemistry CMCs from BAM regarding the lack of key comparisons. He mentioned the MERA project (1st Workshop held in Dec 02 "to discuss and highlight future metrological research trends in Europe which will drive the provision of metrological capability during the coming decade and also to develop future structural scenarios for the development of metrology in Europe").

In summarising Section 6, "Status of Quality Systems and Review Process", Dr Sacconi commented on the benefits of presenting Quality Systems in these fora in comparing and resolving problems.

The Chairman requested more information on the MERA project, in particular requesting details of the future research trends in Europe in metrology. Mr Hetherington responded that the 1st Workshop had tried to highlight expected future trends over the next 10 years. Three main groupings emerged:

- the existing areas within the physical sciences;
- nanometrology across all fields; and
- chemical and biological sciences.

From these, priorities were listed in terms of areas on which to focus in the MERA project. Also discussed were possible future framework scenarios for Europe. The four scenarios put forward ranged from, at one end of the spectrum, carrying on as at present (with every NMI doing its own activity independently) to the other end of having one "NMI" for Europe. The preferred scenario is in the middle of this spectrum. The main question is how resources can be used to achieve an optimal solution within Europe. More information is available on the EUROMET website (http://www.euromet.org/pages/projects/proj.htm). The next phase of the project is to present the outcomes at a workshop in Berlin in June, to which funding agencies of European NMIs will also be invited. Prof Kühne added that participants are looking at the issue of sharing calibration services, which would have the advantage of freeing technical experts to work in new areas. Dr Sacconi noted that two questionnaires are being used, one directed nationally to identify the perceived needs of customers, and another addressed to European stakeholders in metrology at a more general level, to ask them which of the four scenarios they prefer.

The Exec Secretary inquired whether other RMOs could participate in MERA activities as Observers. Mr Hetherington responded that, at this stage it is focused on EU discussions, but dissemination will certainly be part of the process at a later stage. Presentations on MERA outputs will be made at international conferences – for example, the identified trends will be presented at NCSLI 2003 in August; another presentation will be made at the metrology seminar in France in late 2003. Dr Semerjian commented that similar activities are being conducted by other NMIs, e.g., NIST, and he agreed that the sharing of information between countries and regions would be useful.

The Chairman noted the effect of the MRA in bringing the RMOs together. An advantage to be taken of this is in highlighting other areas where joint activities could be undertaken.

Mr Hetherington informed the Committee that the MERA project had highlighted the fact that information on CMCs provided via the MRA allows the identification of services being undertaken by a number of NMIs, so helps to determine how these could be rationalized/optimized in the future.

Dr Semerjian pointed out that, while the sharing of responsibilities is more of a short term matter, the challenges of future trends is a longer term process where the sharing of information would be very useful, and a Conference on the subject would be helpful. The US has a "Continuity of Operations Plan" (COOP) whose aim, among other things, is to consider how services would be provided in the event that something happened to NIST (e.g., due to terrorism, etc). The MRA provides a good framework for identifying other institutions that could take up tasks.

The Chairman added that it is important to look more broadly to identify new priority metrology areas. For example, it is clear that the necessary metrology infrastructure does not exist in medicine. This will be discussed

further under Agenda Item 10, "Other Business". Dr Semerjian mentioned that this is identified in the "NIST 2010" Strategic Planning process.

Dr Semerjian then inquired about EUROMET's approach to Quality Systems for chemistry measurements. Dr Sacconi responded that, where chemistry represents a small part of the services delivered by an NMI, the same standard (ISO 17025) is applied. Prof Kühne added that large institutes, such as LGC and BAM, within countries present their own Quality System, so this is fully integrated into the QS Forum processes. Again the standard used is ISO 17025, although some also have ISO 9000 certification. Dr Sacconi noted that the institute's whole Quality System is presented at QS Forum, *including* all technical procedures.

Dr Semerjian asked whether the standard used for CRMs is also ISO 17025. Mr Hetherington responded that IRMM had a Quality System based on a system in place within the European Commission that is not ISO 17025 but is based on ISO 17025. Dr Sacconi added that this has only been completed in the area of radiation measurements. The Chairman commented that ISO 17025 is a general standard for calibration and measurement services. Institutes can apply other standards for CRMs, etc. Dr Ediriweera noted that, in the APMP region, ISO Guide 34 and ILAC Guide 12 (for the production and certification of reference materials) are being applied by NML-CSIRO and NARL in Australia and by NMIJ in Japan.

Dr Hengstberger commented that in EUROMET there is a requirement for an annual report regarding the maintenance of the Quality System but asked whether there is also a peer review/assessment cycle? Dr Sacconi replied that this is starting to be discussed but, given that there are 80 institutes involved, the actual periodicity of such a cycle is a difficult issue. However a re-accreditation/re-evaluation process is intended.

5.4 SADCMET

Dr Hengstberger tabled Document JCRB-9/5(4). The positions of both the SADCMET Chairperson and Regional Coordinator will be voted on at the April annual meeting. There had been some delay in obtaining APMP's intra-regional review of SADCMET's mass CMCs. Dr Usuda responded that the delays had been partly due to the change in Chairmanship of the APMP Technical Committee on Mass, but this should be resolved shortly. Dr Hengstberger thanked APMP for its assistance in these activities.

The Chairman suggested that the heading of the last column in Table 3 could be re-worded to avoid misunderstanding by government officials. Dr Hengstberger added that he would also add a column to identify the full members of the Metre Convention within SADCMET.
ACTION 7: Dr Hengstberger is to forward the updated SADCMET report to the JCRB Exec Secretary.

Dr Hengstberger noted that there is a process underway to help organizations set up their CMCs. This should lead to more SADCMET members applying to participate as Associates of the CGPM in time.

Dr Castelazo inquired whether Egypt is planning to submit CMCs and, if so, whether these will be reviewed within SADCMET? Dr Hengstberger responded that Egypt has prepared CMCs but is still in the process of putting together its Quality System. This is nearly complete in some fields. NML-CSIR would be part of the intra-regional review but would also bring in experts from other regions. Mr Lam, noting that Egypt is an Associate Member of both SADCMET and APMP, asked what the rule is in terms of which RMO the CMCs are submitted through. The Chairman responded that it is up to the NMI to state through which RMO it will be submitting *all* of its CMCs. Dr Hengstberger added that Egypt has said it will make its submission through SADCMET.
ACTION 8: The Chairman is to check which RMO Egypt has nominated for its CMC submissions.

Dr Castelazo noted that the SADCMET mass CMCs are now quite old. Dr Hengstberger clarified that these are undergoing another intra-regional review within APMP and will be re-submitted for a new round of inter-regional review.

5.5 SIM

Dr Semerjian tabled Document JCRB-9/5(5), summarising the main points. He noted that, as regards Quality Systems, Brazil has chosen self-declaration and Mexico and the US are also adopting self-declaration based on ISO 17025. NIST recently decided to base its declaration on ISO 17025 for all activities.

6. INTER-REGIONAL REVIEW OF CMCs

6.1 Status of CMC reviews

The Exec Secretary confirmed that Document JCRB-10/6(1) was for the information of the RMO-JCRB representatives only. The status of CMC reviews is provided within each RMO report.

6.2 Chemistry CMCs

The Chairman drew the Committee's attention to the report [Document JCRB-10/6(2)] submitted by Dr Willie May, Chairman of the "Amount of Substance Interregional CMC Review Group". CMCs in this area have, to date, not been submitted to the JCRB Exec Secretary to be posted on the website for inter-regional review but, instead, have been sent directly to the technical experts. In particular he highlighted the new proposed action of the Review Group, that the technical experts intend to undertake formal approval of the Cycle III CMCs currently on the JCRB CMC website at their April meeting at the BIPM. He asked Committee members to what extent they consider this process could be adopted in other fields as well.

Mr Hetherington noted that EUROMET MetChem Chair thought that the approach adopted in the QM area has been a good way to build confidence and deal with issues that arise during the review. Dr Kaarls agreed that it works well and, with the meeting held at the same time as the CCQM meetings, it is also a means of tying in the work of the Consultative Committee with respect to Key Comparisons. Dr Sacconi noted that it is not a shortcut but rather a more efficient path. Dr Semerjian added that in fact it is a much more rigorous process, in that it provides the opportunity for the RMOs to discuss common issues jointly.

Dr Castelazo suggested that any impression that this process is not as rigorous is perhaps based on a misunderstanding that the whole review is undertaken during the two-day meeting. This is not the case: after the meeting a conference call takes place once the experts have had a chance to consider the CMCs in more depth. Dr Semerjian pointed out that perhaps the fact that the CCQM has met annually for the last ten years is where it has an advantage over other areas.

Dr Hengstberger proposed that different review methods might be appropriate at different stages of the MRA. At this stage, when the bulk of the data is coming in, it is appropriate to bring people together, but when only a few lines of CMCs are being considered this may not be needed. Dr Semerjian responded that, since essentially the same people attend CC meetings, even the review of a few CMC lines could be better addressed at a face-to-face meeting, due to the pressure put on people by a meeting deadline.

Dr Sacconi inquired whether the group has had problems dealing with uncertainty statements. Dr Semerjian replied that this has definitely occurred but that having everyone look at the uncertainty statements jointly helps identify and resolve issues. Dr Kaarls added that uncertainties are reviewed when the results of the relevant Key Comparison become available.

The Chairman summarised the Committee's view that the approach for reviewing CMCs being followed in the Amount of Substance area is an efficient way of proceeding, and that the JCRB recommends that this process be applied in other areas to the extent possible and appropriate.

Dr Kaarls noted that it is proposed that some CMCs be posted within both the CCQM section *and* the CCPR section. Dr Semerjian clarified that the intention is to ensure that multiple user communities are able to access the data in which they are interested. Dr Hengstberger suggested that there should be some mechanism to highlight the fact that the same capabilities have been published in different areas of the database. These activities are not necessarily undertaken within the same section in all NMIs, so experts need to know where to find all data relevant to their area. Prof Kühne proposed inserting a comment to the effect that the data are available in a different area rather than duplicating the data, which might become dangerous. The Chairman suggested that this might cause difficulties for people who are familiar with accessing data from a particular area of the database in one way, if they have to learn to access it from another area in a different way.
[NOTE: This issue has since been discussed with the KCDB Coordinator, Dr Thomas. Her recommendation is that the CMCs be published in one area only but that a link be provided between the two associated areas. The specific example given here will be considered further at the April 2003 meetings of the CCQM.]

The Chairman informed the Committee that consideration is being given to broadening the search engine strategies provided in the KCDB to make it more powerful and to help address RMOs needs. He invited views

on appropriate strategies to meet needs. Mr Van responded that broadening the ways in which to search the KCDB would be helpful for the APMP Developing Economies' Committee (DEC), which is trying to identify priority areas for comparisons for developing NMIs within APMP.

PROPOSED ACTION 9: The JCRB Exec Secretary and KCDB Coordinator will forward to RMO-JCRB Representatives some options on broadening the range of the KCDB Search Engines. RMO-JCRB representatives will be asked whether these adequately meet perceived needs of users or whether other options are (also) needed.

6.3 Working Groups on CMCs

The Chairman reiterated the CIPM view that these proposed Working Groups not be formed within the Consultative Committees. He drew the Committee's attention to the subsequently re-drafted Terms of Reference given in Document JCRB-10/6(3).

Dr Semerjian objected to the placement of the Working Groups outside the CC environment and requested that the Document created at the 9th Meeting be re-visited [this is Document JCRB-9/8(4)]. He sought clarification of the CIPM recommendation to remove the association with the CCs. Dr Kaarls responded that this had not been a strong point but the view was that it would lead to too much additional work for the CCs. However, Dr Kaarls stated that there is a missing link between these Working Groups and the CCs in terms of information on what Key Comparisons are needed. He referred to Dr May's report [Document JCRB-10/6(2)], which notes areas in which Key Comparisons are needed in the *Recommendations of the April 2002 meeting*.

The Chairman agreed that it is most important that CMC claims be closely linked to Key Comparisons and that, since Key Comparisons are undertaken through the CCs, this is a task that should be identified within the CC structure. He will refer this back to the CIPM with stronger arguments to retain the link with the CCs.[1]

Prof Kühne commented that it would be helpful to have some authority designated to state that "this Key Comparison can be used to check these CMC claims". Dr Tanaka added that he would be raising this issue at this year's CCM meeting so requests the JCRB's views. He had intended to propose some form of cooperation between RMOs to identify which CMC is supported by which Key Comparison.

It was agreed to revert to the original version of the Draft Terms of Reference [Document JCRB-9/8(4)], with two additional items added to the scope of the Working Groups:
"(d) To provide guidance on the range of CMCs supported by particular Key Comparisons
(e) To identify areas where additional Key Comparisons are needed".
The newly revised Draft Terms of Reference are now given in Document JCRB-10/6(3)_rev.

ACTION 10: JCRB Chairman is to re-submit the revised Draft Terms of Reference for "Consultative Committee Working Groups on CMCs" [Document JCRB-10/6(3)_rev] to the CIPM with the JCRB's recommendations for approval.

7. RELEVANT CC MATTERS

The Chairman read out Document JCRB-10/7, "A Note on Supplementary Comparisons".

Prof Kühne sought clarification on the purpose of supplementary comparisons: if they cannot be used to establish the degree of equivalence, do they help support CMCs? The Chairman gave the example of the high frequency area, where alot of comparisons are required for specific artefacts. It was decided that these should not be Key Comparisons, due to the amount of work involved, so they have been identified as Supplementaries. In this example, the purpose of the Supplementary is to cover measurements of specific artefacts and a Working Group within the CC undertook the work.

Dr Hengstberger stated that in Photometry and Radiometry, a comparison was required of the area of absolute radiometers. As a geometrical parameter, the measurement of area was not considered a Key Comparison measurement in photometry, so the measurement of detector areas that also have optical properties became a

[1] Mr Hetherington informed the Committee that a pertinent paper by Dr Marullo-Reedtz, the EUROMET TCEM Chairman, is currently being considered within EUROMET. This paper is discussed further under Agenda Item 9 (page 13). Please note that this is not an official JCRB Document so is not referenced here.

Supplementary Comparison. He recommended that the need for undertaking Supplementary Comparisons be left to each CC to determine.

Dr Semerjian stated that his understanding is that *any* comparison undertaken within a CC is a Key Comparison since these are comparisons at the highest level. There may be many NMIs within an RMO that do not use artefacts at the highest level, so a lower level comparison *related* to the Key Comparison is undertaken by the RMO. The Chairman agreed that the general principal outlined by Dr Semerjian is correct but that, as in the example above of the HF area, in particular cases the CC carries out activities that would normally be carried out by an RMO. He added that it is useful, for example, to have a formal protocol for an RMO comparison of thermocouples, however this is not a Key Comparison in support of CMCs. Supplementary Comparisons, thus, also provide flexibility for comparisons undertaken only at the regional level.
Dr Kaarls asked for clarification of the definition of bilateral comparisons in this context. The Chairman responded that there could be bilateral key *or* supplementary comparisons.

Dr Sacconi noted that the way the term Supplementary Comparison is used is not consistent across metrology areas. The Chairman responded that this is to be expected and that, in Part 1 of the MRA, "national measurement standards" are defined differently in each area. The goal of part 2 is to provide confidence in CMCs through, not only Key, but also Supplementary Comparisons. Dr Sacconi suggested that it would be useful to investigate how the term "Supplementary Comparison" is used in each metrology area.

ACTION 11: The JCRB Chairman is to check the types of Supplementary Comparisons that are currently listed in Appendix B of the KCDB, to help define the term "Supplementary Comparison".

Referring to Section 5.1 of Document JCRB-10/7, Prof Kühne asked that the phrase "to meet specific needs" be clarified. Also, if supplementary comparisons do indeed support CMCs, then they also support degrees of equivalence. Dr Kaarls agreed that the first paragraph of Section 2 is incorrect, and that Supplementary Comparisons do have a reference value, which is used to underpin degrees of equivalence. Both requested that the last sentence in the first paragraph of Section 2 be removed.

ACTION 12: The JCRB Chairman is to remove the last sentence in the first paragraph of Section 2 of Document JCRB-10/7, "A note on Supplementary Comparisons".

Dr Semerjian reiterated that any comparison undertaken by a CC should be a Key Comparison because the CC establishes the protocol, evaluates the associated uncertainties, etc, and operates at the highest level. However, RMO comparisons fall into two categories: if they follow the same procedure as a Key Comparison and if there is a connection through one or more common participants, then it is an RMO Key Comparison; if an RMO does a comparison without an established protocol, then it is an RMO Supplementary Comparison. Supplementary Comparisons involve very different levels of standards, and address needs that may or may not be met within the context of the CCs. The Chairman responded that the problem lies in one sentence in the MRA, in Para T10, which states that CCs can also carry out Supplementary Comparisons. He resolved to recommend the removal of the words "Consultative Committees" when the CIPM MRA is revised. Mr Hetherington agreed that an error seemed to have been made in Para T10, since the situation is properly described in Sections 4 and 5 of the MRA.

Dr Hengstberger asked what problem this is solving. The Chairman responded that Dr Semerjian had just described the appropriate structure. Dr Hengstberger replied that he agreed in principal but, to use the example of the candela, the units (power/unit angle) include a geometrical quantity so photometrists have no choice but to bring in comparisons of dimensional quantities. **The Chairman stated that there is no reason why the CCPR should not undertake a Key Comparison of area.** Dr Tanaka inquired whether viscometry could be a Key Comparison undertaken by the CCQM. The Chairman and Dr Kaarls responded that, again, there is no reason why not.

ACTION 13: The JCRB Chairman is to recommend to the CIPM that the words "Consultative Committees" be removed from Para T10 when the CIPM MRA is revised.

Dr Semerjian inquired whether a Key Comparison can be declared null and void after the fact when it provides no valuable information. The Chairman replied that this is up to the participants and the CC. This option is given in the MRA if there is a "technical failure". Dr Semerjian stated that this could depend on the definition of "technical failure". The Chairman referred him to the third dot point in Section 9 on Page 3 of the "Guidelines for Key Comparisons": *"Note that once all participants have been informed of the results…"* Prof Kühne agreed

that the decision is made by the CC and Dr Kaarls commented that such a situation has occurred already in the CCQM.

8. INTER-REGIONAL HARMONIZATION OF QS REVIEWS

Mr Hetherington first informed the Committee that what is now Document JCRB-10/8(1) has not been changed since the revisions requested at the 9th JCRB Meeting were incorporated.

The Chairman then requested Dr Ediriweera to lead the Committee through APMP's comments to this document. [Please note: APMP's comments are given in Document JCRB-10/8(1b)]. Key points from this discussion were as follows:

1. *APMP's comments on Clause 2.1*

- It was clarified that, independently of how an NMI addresses Clause 7.3, it should provide a description of its Quality System. However, this is not intended to be a large report and can reference other documents. It is up to the RMO to determine if the description provided is sufficient.
- It was considered that the additional item specified by APMP under the statement "The QS operated by the NMI should be…" added unnecessary complexity.

2. *Amendments to the "Technical Requirements" listed on page 4:*

- Added: "CRM certification process (where applicable)"
- Fifth bullet modified: "Calibration and measurement traceability and uncertainty"
- Third bullet modified: "Calibration and measurement methods and method validation."

ACTION 14: Mr Hetherington is to forward the revised "JCRB Guidelines for the monitoring and reporting of the operation of Quality Systems by RMOs" to the Exec Secretary for posting on the website as a finalised JCRB document.
NOTE: Done - the final revised document is Document JCRB-10/8(1c).

9. REVIEW OF MRA DUE FOR 2003

(Please note that Agenda Items 9.1 and 9.2 were in fact discussed jointly.)

9.1 End of transition period of MRA – Interpretation of MRA text &
9.2 Review process for published CMCs and supporting Quality Systems

The Chairman noted that no changes had been made to the document [what is now Document JCRB-10/9(1)] as revised at the 9th JCRB Meeting.

Dr Kaarls commented that there is no statement requiring that CMCs also be reviewed. The Chairman referred him to Document JCRB-9/12, "End of Transition Period of CIPM MRA – Review of Published CMCs". However Dr Kaarls replied that a statement is still required on the need for an on-going review cycle. Prof Kühne commented that this is covered when Key Comparisons are repeated and by the on-going monitoring required by the Quality System. Dr Kaarls objected that this would not capture everything and that the CCs are not required to check CMCs.

Dr Semerjian stated that there are two scenarios that would lead to problems: the Quality System could be no longer effective, or the results of Key Comparisons could lead to CMC claims not being justified. It is not clear that, outside of these two circumstances, an on-going review mechanism for CMCs is needed, since there is a periodic review built into the Quality System. Dr Sacconi noted that Dr Schwitz had highlighted the importance of a connection between the Quality System and the associated measurements, and agreed that an effective Quality System should ensure that the NMI is able to monitor associated technical issues. The QS Forum process includes a check as to whether a procedure exists to re-align CMC claims based on the results of Key Comparisons. Dr Kaarls agreed that this problem is addressed by the Quality System if a real assessment is carried out, but not otherwise. Prof Kühne responded that the network of checks now in place is very good and is at the limit of what NMIs can undertake, so new requirements should not be introduced.

Prof Kühne then referred to the paper of Dr Marullo-Reedtz, the Chairman of EUROMET's TCEM. The Chairman repeated that, contrary to the view expressed in the EUROMET TCEM paper, he considers that the principal responsibility for monitoring the impact of Key Comparison results on CMC claims rests with the NMI itself. It is only when this does not happen that the responsibility should then be taken up by the RMO and the CC. It would involve a huge amount of work for the pilot laboratory to undertake this for each Key Comparison. The NMIs that have participated in the Key Comparison should know immediately if there is an impact on their

CMC claims. Prof Kühne replied that the pilot laboratory is the most qualified to provide information on the uses that can be made of the results of a Key Comparison. These issues must be considered when Drafts A and B of the Comparison are being written, so it should be straightforward to incorporate them in the report. Dr Sacconi agreed that this would simplify the consequent actions for the NMIs.

Mr Hetherington noted that the paper by the EUROMET TCEM Chairman has not yet been discussed within EUROMET but only within the TCEM group. Dr Semerjian pointed out that the document has in fact been distributed to other RMOs. Dr Vasiliev proposed that it would be best to discuss this issue at the next CCEM meeting and, based on the outcomes, table it for discussion at the next JCRB meeting. He expressed concern about the additional workload implied for pilot laboratories. Dr Semerjian stated that he thought the JCRB had agreed that the Working Groups on CMCs would deal with this issue. The experts responsible for each Key Comparison should provide guidance on what areas the Key Comparison affects, but the implication of the results of the Key Comparisons vis-à-vis CMC claims should be undertaken by the Working Groups on CMCs. Dr Kaarls commented that CMCs are not only based on the results of Key Comparisons so it is necessary to review them on a broader basis. Dr Semerjian responded that the Working Groups on CMCs should be in a position to undertake this.

Mr Hetherington cautioned that there may be a slight danger of duplication of work. NMIs also have a responsibility for this, but this should be covered by their Quality System. The Chairman proposed that the EUROMET TCEM paper be considered within EUROMET first before being discussed further by the JCRB. If, in the light of experience, it becomes apparent that NMIs are not taking care of this issue, consideration should then be given as to how best to address it. Mr Hetherington responded that the paper would be tabled at the next EUROMET Executive Committee in late March 2003.

The JCRB confirmed Document JCRB-10/9(1).

10. OTHER BUSINESS

10.1 Distribution of Letter to Directors

The Chairman referred participants to Document JCRB-10/1, which outlines the distribution of the "Letter to NMI Directors of States not yet Members of the Metre Convention or Associates of the CGPM". On the basis of this distribution, two inquiries have been received to date – one from Guyana and one from Slovenia.

10.2 Progress on JCDCMAS

The Chairman informed the Committee that a meeting has been called of "NMI Representatives from Member States of the Metre Convention" to discussion participation in the JCDCMAS activity. It will be held at the BIPM on 21st March 2003. The draft Agenda and current list of participants are provided as Documents JCRB-10/10(2b) and (2c).

He noted that the Terms of Reference for the JCDCMAS were modified based on comments from the CIPM [the revised Document is JCRB-10/10(2a)]. The meeting on 21st March is also a response to the CIPM's comments that, as the BIPM is a treaty organization, it should be aware of Members' interests when representing them in such a forum. It is not the intention that the Joint Committee simply be a "talking shop" but that it should provide added value to developing States.

Mrs Marobela inquired whether States that are not Signatories of the Metre Convention could make their views known. The Chairman responded that this should be done through a participant in the meeting. Mr Lam noted that the memberships of the various organizations involved in the Joint Committee are quite different and that it is important that participation, for example, in any metrology projects identified not be restricted to member states of the Metre Treaty. He added that this is a very important initiative, in that it would help provide developing countries with a coherent consistent message. The Chairman noted that representation of the RMOs in the Joint Committee could perhaps be addressed through the JCRB. Mr Van suggested that the JCDCMAS activity could help encourage developing countries to join the MRA.

Dr Semerjian inquired about the type of assistance envisaged – would the Joint Committee be involved in obtaining funding? The Chairman responded that this is not to be the role of the Joint Committee. Rather, the Committee intends to work together to ensure that resources applied to these activities are complementary rather than duplicative. Mrs Marobela commented that it is important that resources applied are directed appropriately

and focused. Dr Kaarls noted that the main objective is to harmonise the activities of the partners, so that they are coherent, objective and coordinated. The aim is also to promote the importance of these activities among financial sponsors.

The Chairman informed the Committee that a closely related matter that arose from the joint meeting in late February 2003 between the BIPM, OIML and ILAC, is the proposal to hold a follow-up seminar in 2004 to the 1998 PTB event directed at developing countries. Dr Seiler of the PTB had suggested that the planned 2004 event involve more decision-makers, however the general view is that there is not much chance of attracting these people from developing countries. Instead, discussions should take place at the 2004 PTB meeting with metrology people from the developing world to identify the best mechanisms for making approaches to high profile decision-makers in developing countries.

Dr Castelazo noted that the SIM regional awareness seminars have a similar objective. He agreed that the RMOs should participate together in addressing the objectives of the JCDCMAS. It is difficult to bring the relevant people together to a meeting in Europe so the message could be conveyed by the RMOs through regional workshops.

Dr Hengstberger cautioned that, in the SADC experience, it is not helpful to promote one element like metrology alone to developing countries. What decision-makers should be told is how all the elements fit together to benefit a country's involvement in global markets, etc. The most impact can be achieved if all elements are delivered as a package, which is where the JCDCMAS can help. He added that the BIPM should also ensure that it promotes a coordinated message.

10.3 BIPM-ILAC MoU and related issues

The Chairman drew the Committee's attention to the paper provided by Prof Wallard [Document JCRB-10/10(3)]. He noted that EUROMET had produced a related paper on these issues.

Please note that, on Dr Semerjian's request, Prof Kühne's paper has been re-numbered as Document JCRB-10/10(4) – so the ILAC Report has become Document JCRB-10/10(5).

10.4 EUROMET strategy concerning CMCs

The Chairman invited Prof Kühne to introduce the EUROMET paper. Prof Kühne stated that this was based on the issue raised at the 9th JCRB meeting as to what ILAC bodies should do when they accredit a calibration laboratory that has a calibration certificate with an uncertainty significantly smaller than the uncertainty claimed in the corresponding CMC of the NMI as published in the KCDB. The responsibilities implicit in the first part of the MRA lie with RMOs and NMIs in terms of establishing the degrees of equivalence. However the responsibilities of accreditation bodies in accrediting calibration laboratories enter into the second part. Calibration laboratories do not maintain primary standards but must be traceable to standards that are internationally traceable to SI units. It is already understood that the currently listed capabilities in the KCDB are not necessarily at the highest level. Also some NMIs have "secondary" national standards traceable to other NMIs. An NMI gives traceability to calibration laboratories as a routine service covered by a CMC. If the calibration laboratory wants to back up its claims with the MRA and is claiming smaller uncertainties than the CMCs of its NMI, then it should follow the same procedure as the NMI, i.e., participate in comparisons to demonstrate its capabilities and establish its degrees of equivalence.

Dr Castelazo asked where EUROMET considered the results of such comparisons should be published. Prof Kühne replied that this should be done as per any other Key Comparison. Dr Semerjian inquired whether the discussion is about comparisons or traceability. Prof Kühne responded that, in the case of NMIs, it is clear that traceability is through participation in Key Comparisons, whether the NMI maintains primary standards or secondary standards traceable to another NMI. An appropriate MRA mechanism is needed for the case where a calibration laboratory, as required by ISO 17025, establishes traceability to the SI through calibration by an NMI which is maintaining the national standard but the corresponding CMC entry of that NMI in the KCDB has an uncertainty that is larger than the calibration certificate.

The Chairman stated that if an NMI issues a certificate with uncertainties smaller than those in its CMCs, but within those arising from the corresponding Key Comparison there is no problem. However, questions arise if they are smaller than the Key Comparison uncertainties as well. Prof Kühne inquired why an NMI would not claim the smaller uncertainties from key comparison results in its CMCs. The Chairman responded that CMCs

are defined as the services that the NMI *normally* provides. Dr Kaarls added that the Key Comparison is a snapshot of capability.

Prof Kühne commented that, at present, the NMI world leaves it to the accreditation bodies to judge whether higher levels claimed by calibration laboratories are justified, which does not make sense. The Chairman asked what is the extent of this problem. Prof Kühne responded that that is a question for the accreditation community to answer. Dr Kaarls replied that he understood that the accreditation community has come up against this problem.

Dr Semerjian stated that, from the discussion at the 9th JCRB Meeting, he understood that the issue concerned an NMI that undertakes a calibration for another NMI, to meet a particular request, with a lower uncertainty than given in its CMCs. This situation occurs quite often, but is substantiated when the second NMI has to demonstrate its capabilities by participating in a Key Comparison. If this situation occurs with respect to a calibration laboratory that needs a higher level measurement, there is no way of substantiating this. However, unless the measurement in question becomes *routine*, this should be considered a special case that it is up to the accreditation body to investigate properly. Such special cases should not be ruled out, but the MRA is to facilitate international trade, to give confidence in the general capabilities of NMIs and to recognize calibration certificates.

The Chairman agreed that, as a special case, this is the responsibility of the accreditors. The MRA states that what are covered are "services ordinarily available", which could be at different levels up to the top level of those services *ordinarily* available. Dr Sacconi agreed that it is outside the scope of the MRA to include these cases.

Prof Kühne asked whether it is true that an NMI may not be performing at its highest level even in a Key Comparison, so that it could provide traceability at a level higher than demonstrated in a Key Comparison. Dr Semerjian responded that this was a matter of the resources it was appropriate to put into the Key Comparison participation. For example, it cannot be expected that PTB or NIST would perform at their highest possible level.

Prof Kühne reiterated that the question is the confidence that people outside the metrological community can have in the measurements and that the NMI community should aim to provide this confidence at the highest possible level. It is putting all of this effort into establishing this confidence at the *routine* level, but should also be establishing this confidence in the best possible measurements being made. The accreditation community is looking to the NMI community to check that the traceability is valid because it has the expertise. Such calibration laboratories should have the same requirements placed on them (i.e., participation in comparisons) to claim the smaller uncertainties. The issue to be addressed is the international recognition of the calibration certificate: who should provide the peer review and the international confidence in this? The goal of the MRA was to give confidence to people outside the metrology community. Dr Sacconi responded that the MRA is about mutual recognition not about scientific capability. By including this in the MRA when it is a special case, it introduces a dangerous loophole/precedent. He requested a JCRB statement on this matter to clarify it.

The Chairman stated that one-off capabilities should always be possible, but these do not enter into the areas covered by the MRA. He pointed out that the difficulty arises in the top two paragraphs on the second page of Prof Kühne's paper, which seem to imply that NMIs provide calibrations at a higher level *on a regular basis* to calibration laboratories. What is being discussed is a special case. If such services are given on a *regular* basis then they should be included in the MRA. The Chairman concluded the discussion by saying that he and the Exec Secretary will draw up a short report on the discussion to clarify the JCRB's views on this subject. He repeated that the scenario described in the first two paragraphs of Prof Kühne's paper should not happen "on a regular basis". Dr Semerjian added that if these measurements do happen on a regular basis, then it is very appropriate that the issue is raised here but this can't be done for a hypothetical case.

Mr Lam suggested that the provisions in ISO 17025 may provide the solution to this problem, since it asks for the scope of measurements provided by an NMI, in terms of developing method validation.

ACTION 15: The Chairman and Exec Secretary are to draft a document to outline the JCRB's views on the situation when a calibration laboratory claims uncertainties smaller than those claimed in the associated NMI's CMCs published in Appendix C of the KCDB. This document will be tabled for discussion and approval at the next JCRB meeting.

10.5 ILAC Report

The Chairman noted that the essential points from Dr Benyon's paper (Document JCRB-10/5) had been discussed under the previous Agenda Item.

10.6 CIPM-WHO MoU

The Chairman provided the background to this Agenda Item, in the establishment of the Joint Committee on Traceability of Laboratory Medicine (JCTLM), driven largely by the future implementation of the EU Directive on in-vitro diagnostic devices. At the June 2002 Workshop on Traceability in Laboratory Medicine, it became clear that a more formal metrological structure is required. Also, the related ISO standard (ISO 15195) is making clear reference to an international measurement system that does not exist. A Memorandum of Understanding (MoU) has now been established between the WHO and the CIPM, to formalise the agreement that the BIPM and the WHO will collaborate to put the appropriate system in place. One consequence is that the MRA in due course will include more of these quantities and therefore, the associated tasks (comparisons, etc) will need to be undertaken to provide the technical basis. In most countries there is no clearly recognized system of traceability in this area. This is being investigated by one of the two JCTLM Working Groups. The two Working Groups are to operate under the authority of the CCQM and the WHO has agreed to be represented on the CCQM to make the necessary technical links. What is missing is the higher level contact, so the BIPM will work with the WHO to make this contact between national ministries of health and the NMIs.

Dr Semerjian requested that the two documents referenced by the Chairman become JCRB documents. **Please note that these are now Documents JCRB-10/10(6a) and (6b).**

Dr Semerjian noted the importance of *all* RMOs participating in these activities since health-related issues clearly do not have boundaries. He informed the Committee that, in the US, a trillion-and-a-half dollars is spent on health-care, of which 25% is related to measurements. In Germany, the numbers are comparable. The sad part is that about 20% of those dollars are spent on non-diagnostic purposes – repeat, i.e., redundant, measurements. There are clearly significant trade implications. Participation in these activities needs to be expanded outside Europe. This is being helped by the work of the Chairman with the WHO. Everyone will benefit if this is approached as a global effort. Broader participation by the international metrology community will also provide greater credibility for the cooperation with WHO.

The Chairman added that he hopes that this activity will have made sufficient progress for a statement to be made at the 22nd CGPM but this will depend on the support of all NMIs.

Dr Hengstberger noted that this is an increasingly important area for most developing countries, for example, with respect to agriculture, etc. He urged that the strategy should not just focus on issues relating to human health, but also animal and plant health to take account, for example, of the WTO SPS (Sanitary and Phytosanitary Measures) Agreement. Again, these areas have huge trade implications. Nationally, South Africa has realized the importance already and contact has been made with the national health department. National actions will be supported by the international work. He added that it is worth the effort of re-organising what is being done at the BIPM to ensure that the opportunity is grasped.

The Chairman agreed that there is a small window of opportunity that needs to be taken advantage of. Dr Kaarls added that this activity also involves Codex Alimentarius and the FAO (the Food and Agriculture Organization of the UN).

Dr Sacconi inquired whether there had been any responses as yet from governments. The Chairman replied that it was too soon for responses. Dr Semerjian commented that NIST has had responses from the CDC (Centers for Disease Control and Prevention) and the FDA (Food and Drug Administration), the two principal US organizations (together with the NIH [the National Institutes of Health], but this is more research focused). He noted that one issue is that metrologists need to establish credibility with the medical community. NIST is also working with the Mayo Clinic for example, which has a huge hospital-patient population so can accumulate a lot of data. Such data can be used to demonstrate that measurement uncertainty translates into a lot of money and people, to highlight the importance of accurate measurement to the medical community. The Chairman noted that representatives from the CDC, FDA and the Mayo Clinic attended the June Workshop, as did a representative from the European Commission. The point about credibility is very important, and the collaboration with the WHO provides the necessary linkage.

Dr Sacconi pointed out that one difficulty is the obsolete structures in place in many countries and the very loose interactions between fields. In Italy, for example, the NMIs rely on one Ministry but the Metre Convention link is with the Trade and Commerce Ministry. This new linkage means working additionally with the Health Ministry. The Chairman suggested that the WHO-CIPM MoU could be used to show that the linkage is being made at the international level and should also be undertaken nationally. Dr Hengstberger added that there should already be a link with Health Ministries through an NMI's radiation dosimetry activities.

11. APPROVAL OF DOCUMENTS TO BE DISSEMINATED

The Committee agreed that the following documents could now be publicly disseminated:

- Doc JCR-10/0: Agenda
- Doc JCRB-10/01: List of Participants
- Doc JCRB-10/04: KCDB Report
- Docs JCRB-10/05(1-5): RMO Reports
- The modified version of Doc JCRB-10/07: A note on Supplementary Comparisons
- Doc JCRB-10/08(1c): the revised "JCRB Guidelines for the monitoring and reporting of the operation of Quality Systems by RMOs"
- Doc JCRB-10/9(1): Interpretation of Paragraph 11.3 of CIPM MRA concerning the end of the transition period

The Chairman added that the "Letter to Directors.." will be made available on the BIPM website.

12. DATE AND PLACE OF NEXT MEETING

12.1 Future operation of JCRB and associated meetings

The Chairman began by noting that most of the significant issues have been dealt with, so the question is how best to continue the work of the Committee. At this stage, six-monthly meetings are still appropriate but the Committee should being looking at broader topics.

Mr Hetherington stated that future meetings could be conducted in one day. He agreed that it is an ideal opportunity to discuss other topics of general interest, such as the medical area, future trends, etc. He proposed a full day's discussion on the strategic frameworks being put in place by RMOs.

The Chairman cautioned that some of these areas will be better covered by Directors' Meetings and that the JCRB discussions should be loosely connected with the MRA. Dr Semerjian suggested that perhaps the JCRB discussions could be coordinated with Directors' meetings, to take advantage of the synergies. Perhaps such joint discussions could be timed with the JCRB meeting early in the year rather than with both JCRB meetings. Prof Kühne agreed that having one meeting connected with the Directors' meeting would be a good opportunity to address strategic issues relating to the MRA. The Chairman agreed with linking the discussions with meetings of Directors. Dr Castelazo suggested that it preparatory discussions should be held before the meeting with Directors, with sufficient time between the two to discuss issues with Directors before the Directors' meeting.

The Chairman reminded the Committee that the next JCRB meeting is scheduled for Monday 6 and Tuesday 7 October, that 8-10 October are CIPM meetings and that a Directors' meeting is being held on 15 Oct.

Dr Imai stated that the ending of the transition period and the issues to be resolved regarding developing economies and laboratory medicine mean that the next JCRB meeting will need one-and-a-half to two days. **The Chairman agreed that the next meeting will take place over one-and-a-half days, beginning at 2 pm on Monday 6th October.**

Dr Hengstberger suggested that strategic planning be considered on how to effectively involve countries that are outside the net of the RMOs. Consideration is being given within SADCMET as to how best to contribute to other regions in Africa. One approach has been to select countries from outside SADCMET to be Associates (Nigeria) to help develop regional bodies in other areas. Dr Castelazo added that this will happen due to trade forces in any event and that similar developments are taking place in the SIM region. Smaller countries are developing laws, bureaus of standards and then physical standards - they may not be very active now but this will change in a couple of years. He came back to the issue of membership fees, stating that it would be good to know if this an issue within the APMP or SADCMET contexts.

The Chairman concluded that each RMO is to prepare a presentation on how it is addressing the issue of increasing participation in the MRA for the October JCRB meetings.

ACTION 16: RMO-JCRB Representatives to prepare presentations on the topic: "How to extend the range of participation of countries in RMO and MRA activities", to be presented at the October JCRB meetings.

Mr Hetherington noted that the MERA project is due to finish at the end of October, at which stage a report will need to be made to the European Commission. **He volunteered to make a presentation on the project at the 15th October Directors' meeting.** He suggested discussing this also at the joint JCRB-Directors meeting in April. The Chairman suggested that the next Directors' meeting, to be held at the end of April 2004, could be a two-day meeting with a focus on strategic directions.

Dr Semerjian proposed using the October meeting to prepare for a Workshop to be held in conjunction with the April meeting.

Mr Lam inquired about the agenda for the October Directors' meeting. The Chairman responded that the issues to be discussed include: formal approval of the continuation of the CIPM MRA and future strategies and measurement systems for medicine.

Dr Castelazo informed the Committee that CENAM would be interested in hosting a JCRB meeting, perhaps the second meeting in 2004.

13. CLOSE OF MEETING

The Chairman then thanked all participants for their contributions and closed the 10th meeting of the JCRB.

FIRST REPORT OF THE CHAIRMAN OF THE JCRB TO THE CIPM AND TO THE DIRECTORS OF SIGNATORY INSTITUTES OF THE MRA

The JCRB has met five times, once in 1998, twice in 1999 and twice in 2000. The terms of reference of the JCRB give it the responsibility for the operation of part two of the MRA concerned with mutual recognition of the calibration and measurement capabilities of the signatory NMIs. This has been the principal subject of the activity of the JCRB.

This first report of the activities of the JCRB essentially comprises the reports of the first five meetings together with a few other documents that, taken together, constitute the Archive of the JCRB. These are:

1. Report of the first meeting of the JCRB (*Held at the BIPM, 21 February 1998*)
2. Report of the second meeting of the JCRB (*Held at the BIPM, 15, 16 February 1999*)
3. Report of the third meeting of the JCRB (*Held in Charlotte, NC USA, 15 July 1999*)
4. Letter from the Chairman to RMO representatives dated 24 November 1999
5. Report of the fourth meeting of the JCRB (*Held at the NIST, 20,21 March 2000*)
6. Letter from the Chairman to RMO representatives dated 8 June 2000
7. Report of the fifth meeting of the JCRB (*Held at the BIPM 11 to 13 October 2000)*
8. JCRB document JCRB-5/1 (*JCRB Rules of Procedure for CMC entry into Appendix C of the MRA, October 2000*)
9. JCRB document JCRB-5/2 (*JCRB Statement on CMC Evaluation, October 2000*)
10. JCRB document JCRB-5/3 (*Timetable for Submission of CMCs to the JCRB for Entry into Appendix C of the MRA, October 2000*)

Items 4 and 6 of the Archive are letters from the Chairman to the members of the JCRB, i.e., representatives of the RMOs, and contain important matters of policy or procedure.
I also attach the current list of the members of the JCRB. All my formal contacts with the RMOs, in particular for the reception of data for Appendix C, are through the RMO Representatives to the JCRB.

In order to provide immediate access to information on the activities of the JCRB, I am preparing a new section to be added to the BIPM website that will be headed JCRB. This will include latest information on JCRB decisions and the names of the RMO contacts.

The JCRB has taken a key role in the coordination of the submissions of calibration and measurement capabilities (CMCs) for Appendix C of the MRA. The first set of CMCs approved for inclusion in Appendix C was for Length and was officially entered into Appendix C on 13 December 2000. Close behind length is Electricity and Magnetism, which will be entered during the first weeks of 2001. These two sets of CMC data result from an enormous amount of work within the NMIs. I take this opportunity to acknowledge this and to pay tribute also to the coordinators of these subject fields in the RMOs who carried a very heavy load of work and responsibility.

The JCRB has decided that for the immediate future it will meet twice a year, normally in March and October, and it has set up a Timetable for the entry of new CMC data into Appendix C (Item 10 in the above list).

As I announced at the meeting of directors of NMIs in October, the BIPM Key Comparison Database and the NIST International Comparison Database are now separate databases that serve different purposes. The BIPM KCDB serves the MRA and contains Appendices A, B, C and D of the MRA while the NIST database is becoming a resource for SIM and for the particular needs of the USA. At the time of the signing of the MRA we envisaged that up until 2003, the BIPM and NIST databases would be identical but in fact we have been able to move much faster than expected. I would like to take this opportunity of thanking the NIST for the support it gave during the development phase of the BIPM KCDB, a support without which we would not have been able to advance so quickly.

Finally, I am pleased to acknowledge the strong sense of cooperation within the JCRB without which the difficult task of reaching agreement on procedures for approving CMCs would not have been possible. This is, of course, evidence of the importance of the task and of the clear intention of the participating RMOs to bring the work to a successful conclusion. The is a very good sign for the future success of the MRA.

My next Report will be in December 2001.
T.J. Quinn
Chairman JCRB

SECOND ANNUAL REPORT OF THE CHAIRMAN OF THE JCRB TO THE CIPM AND TO THE DIRECTORS OF SIGNATORY INSTITUTES OF THE MRA – FEBRUARY 2002

This report covers the activities of the Joint Committee of Regional Metrology Organisations and the BIPM (JCRB) for the calendar year 2001.[1]

The JCRB met twice in 2001:

- The 6th JCRB meeting was held on 8-9 March at the National Institute of Standards and Technology (NIST), Gaithersburg, USA on the occasion of the celebrations marking the centenary of the foundation of the then NBS.
- The 7th JCRB meeting was held on 8-9 October at the BIPM in Paris.

The Reports of the 6th and 7th JCRB meetings are given here as Appendices 1 and 2 respectively. In Appendix 3, I give a current list of the members of the JCRB, i.e., the RMO representatives to the JCRB plus the Chairman.

The JCRB section of the BIPM website is now well established. In addition to providing a contact list of RMO Representatives to the JCRB, the website (http://www.bipm.fr/enus/2_Committees/JCRB.shtml) currently provides the following publicly accessible documents:

1. Timetable for submission of CMCs to the JCRB for entry into Appendix C (Document JCRB-7/21, 9 October 2001);
2. BIPM instructions for drawing up CMC excel files (8-9 March 2001, revised February 2002);
3. JCRB Rules of Procedure for CMC entry into Appendix C (Document JCRB-7/1, Revised October 2001); and
4. Appendix E of the CIPM MRA, "Terms of Reference of the Joint Committee of Regional Metrology Organizations (RMOs) and the BIPM".

The JCRB Website also provides password access for JCRB members to a current set of Working Documents. At the time of this Report, these comprise the Discussion Papers from the 6th and 7th JCRB Meetings. In addition, I have created an interactive website for JCRB members to enable us to maintain an up-to-date list of CMCs undergoing review and the current state of each review. Each RMO representative to the JCRB has password access that allows the updating of the website in respect of CMCs submitted by that RMO. The Chairman notes on the website each of the actions and the date at which each took place according to the review procedure in document JCRB-7/1, which is on open access. This website can be viewed, but not changed, by anyone from an NMI who is given a simple guest password. The address of this site is: www.bipm.org/JCRB To view this website, the login name is "guest" and the password to view is "guest 2001" This website, which was launched early in 2001, has shown itself to be an essential part of an orderly and open review process.

Appendix C now includes some twelve thousand individual CMCs from most areas of metrology. An increasing number are now coming from chemistry. The format for presenting the chemistry CMCs was the subject of extensive discussions within the CCQM.
During 2001, the following CMCs were approved by the JCRB:

- Gas mixtures: APMP, COOMET, EUROMET and SIM.
- Photometry and radiometry: APMP, EUROMET, SADCMET and SIM.
- Acoustics, ultrasound and vibration: APMP, EUROMET, SADCMET and SIM.
- Electricity and magnetism: COOMET.
- Length: EUROMET (2nd set).
- General chemistry: APMP, COOMET, EUROMET (approval on 12 February 2002) and SIM.

The chemistry section of the database was first set up for the gas analysis CMCs. It is now being expanded to include general chemistry. We have found that the development of a database suitable for the increasing number and range of CMCs is a highly complex task. We are much indebted to many RMO contact persons and Chairmen of CC working groups for their advice and understanding during this period of development.

The entry of all these data reflect only a part of the enormous amount of work that is continuing to be undertaken by staff of the National Metrology Institutes. In addition to the preparation and reviewing of CMC data, there is

[1] The "1st Report of the Chairrman of the JCRB to the CIPM and to the Directors of Signatory Institutes of the MRA" was produced in December 2000.

the ongoing process of carrying out key and supplementary comparisons and reviewing and writing up the results. The BIPM is now receiving Final Reports of key comparisons at the rate of about one a week. The whole operation of the MRA now includes close collaboration between members of Consultative Committees and Working Groups, the members of the Technical Committees of the Regional Metrology Organisations and members of the JCRB themselves together with members of the staff of the BIPM. The credibility and effectiveness of the CIPM MRA are wholly dependent on the substantial work of these various parties, to whom I pay tribute.

As part of the publicity now being made for the BIPM key comparison database, a leaflet was prepared in 2001 and widely distributed. At the PITTCON Conference in New Orleans in March 2002, the BIPM will have part of the NIST stand and will publicize the database and MRA among the chemistry community. The MRA and related activities now figure in the programme of many international and national metrology conferences.

The JCRB adopted the wording of a statement that it recommends be put on calibration and measurement certificates issued by NMIs. This statement is the following:

This certificate is consistent with the capabilities that are included in Appendix C of the MRA drawn up by the CIPM. Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (for details see http:://www.bipm.org).

The JCRB proposed that each RMO and country be responsible for preparing texts in their own language. It was requested that copies of the various language texts be sent to the Chairman of the JCRB for the JCRB archives. In consultation with the BNM, the French text has been agreed as follows:

Ce certificate.....

The JCRB was of the opinion that the presence of such a statement on NMI calibration certificates will be an important way of publicising the MRA and will be a useful service to the user.

The evolution of the MRA has led to several key issues arising in JCRB discussions over the year:
1. The importance of inter-regional harmonisation of CMC reviews.
2. Closer examination of the procedures used in different regions to meet the requirements of paragraph 7.3 of the MRA – i.e., the establishment of NMI Quality Systems and the need for inter-regional harmonisation of QS reviews.
3. The need to increase awareness among users of the existence and importance of the CIPM MRA.
4. The implications of the approaching end of the transitional period of the MRA, in October 2003.

All of these items will be treated by the JCRB during 2002. Another important matter to be addressed by the JCRB in 2002 will be identifying means of assisting developing countries' participation in the MRA.

The JCRB will continue its schedule of two meetings in 2002, the first of which will be held in March in Pretoria at the invitation of SADCMET, and the second in October at the BIPM. This follows the practise now adopted in which the March meeting is held in one of the regions and the October meeting at the BIPM.

The degree of cooperation between RMO representatives to the JCRB continues to provide a strong foundation for the work of the JCRB, and I express my appreciation for their on-going enthusiasm and active participation.

T J Quinn
Chairman, JCRB.
15 February 2002.

3rd ANNUAL REPORT OF THE CHAIRMAN OF THE JCRB TO THE CIPM AND TO THE DIRECTORS OF SIGNATORY INSTITUTES OF THE MRA – MARCH 2003

This report covers the activities of the Joint Committee of Regional Metrology Organizations and the BIPM (JCRB) for the calendar year 2002.[1]

The JCRB met twice in 2002:

- The 8th JCRB meeting was held on 5-6 March at the CSIR, Pretoria, South Africa.
- The 9th JCRB meeting was held on 3-4 October at the BIPM in Paris.

Copies of the Reports of the 8th and 9th JCRB meetings are provided in Appendix 1 and 2 respectively. In Appendix 3, I have provided a current list of members of the JCRB.

In February 2002, the JCRB Chairman appointed Dr Angela Samuel as JCRB Executive Secretary (on secondment from NML-CSIRO, Australia) to help coordinate the activities of the Committee.

Following the decisions taken at the 8th JCRB meeting, the JCRB section of the BIPM website (http://www.bipm.org/enus/2_Committees/JCRB.shtml) now includes a restricted-access Section providing JCRB Meeting Documents of relevance to RMO technical experts. This is in addition to the open Section of the webpage providing publicly accessible JCRB documents and the restricted-access Working Documents Section for JCRB members providing the discussion papers for the 6th, 7th and now 8th and 9th JCRB meetings.

The interactive JCRB CMC website (www.bipm.org/JCRB) lists CMCs undergoing review and the current state of each review. As agreed at the 8th JCRB meeting, access to this website has been expanded from solely JCRB members (to update the review status of CMCs) to now also allow access by RMO Technical Committee/Working Group (TC/WG) Chairs (using RMO TC/WG-specific usernames and passwords). A "Technical Reviewer's Logbook" can be created by the RMO TC/WG Chair for a set of CMCs, in which the TC/WG Chair can record the progress of the review. Currently, of 58 sets of CMCs listed on the website, 27 have been approved/published and seven are awaiting final approval; logbooks are being used with 17 of the 24 sets under review. The JCRB Exec Secretary (on behalf of the JCRB Chairman) coordinates the overall progress of each review according to the procedures in Document JCRB-7/1. The modifications made during 2002 have been intended to enhance the website's purpose in providing an orderly and transparent review process.
(Note: The JCRB CMC website can be viewed, but not changed, by anyone from an NMI using the simple guest password: login name "guest", password "guest 2001".)

Other decisions of note from the 8th and 9th JCRB meetings are listed here:

- RMO CMC submissions are to include the report on the intra-regional review, providing a checklist indicating which of the items in the list of criteria provided in Document JCRB-8/13(1b), *Criteria for acceptance of data for Appendix C*, have been addressed with any associated comments. (Note that the original list of criteria has been further clarified in the above Document, following discussions at the 8th JCRB meeting.)
- Based on the recommendations of the *Ad-Hoc JCRB Working Group on CMC uncertainties* to the 8th JCRB meeting, which identified possible misunderstandings of CIPM MRA terminology when interpreted by the accreditation community, the JCRB definitions of the terms "Calibration and Measurement Capability" and "Uncertainty Determinations for CMCs" are now defined in Document JCRB-8/18.
- Document JCRB-8/13, "Interpretation of Paragraph 11.3 of CIPM MRA concerning the end of the transition period", was tabled at and revised based on comments received from the April 2002 meeting of NMI Directors. The end of the transition period of the MRA is defined in this Document as **31 December 2003**. The document provides guidance on the status of the MRA and KCDB up to and following the end of the transition period. An additional document, developed at the 9th JCRB Meeting on the "End of Transition Period of CIPM MRA – Review of Published CMCs"(Doc JCRB-9/12) identifies the procedures to be followed by NMIs and RMOs to ensure that CMCs already published in the KCDB appropriately fulfil all criteria as required after the end of the transition period.
- The *Ad-Hoc JCRB Working Group on NMIs' Quality Systems* produced the "JCRB Guidelines for the monitoring and reporting of the operation of Quality Systems by RMOs" [revised Document JCRB-9/10(1_rev)].

[1] The 1st Report "of the Chairman of the JCRB to the CIPM and to the Directors of Signatory Institutes of the MRA" was produced in December 2000, and the 2nd Report in February 2002.

- The JCRB recommended the formation of "Consultative Committee Workings Groups on CMCs" [Terms of Reference given in Doc JCRB-9/8(4)] to facilitate the inter-regional CMC review process and to coordinate the review of existing CMCs based on the results of key and supplementary comparisons.

A total of some 14,000 individual lines of CMCs are now available to users in Appendix C of the KCDB, compared with around 12,000 by the end of 2001. Many CMCs are still missing, especially in the areas of Chemistry, Thermometry, Ionizing Radiation and Time and Frequency. During 2002, the following sets of CMCs were approved by the JCRB and published in the KCDB:

- Amount of Substance (General Chemistry), declared via APMP, COOMET, EUROMET and SIM;
- Mass and Related Quantities, declared via APMP (Malaysia, Japan), via SIM, via EUROMET, and via COOMET;
- Ionizing Radiation, declared via COOMET and SADCMET and by the International Atomic Energy Agency;
- Acoustics, Ultrasound and Vibration, declared via COOMET and via EUROMET;
- Photometry and Radiometry, declared via SIM and via EUROMET.

By the end of 2002, Appendix C included:

- 11717 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
- 84 CMCs declared in the field of Ionizing Radiation.

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

The design of Appendix C of the KCDB evolved significantly over 2002:

- The Appendix C Chemistry section was extended to cover all categories, and a filter was applied to the Chemical category in the search engine.
- The Appendix C Ionizing Radiation section was created, using a new search engine based on the selection of a "Quantity", a "Source" and a "Medium".
- A facility for publishing tables of uncertainty was created. A large number of CMCs corresponding to the same measurand, which can take a number of different values, and to the same parameter, which can also take a number of different values, can be concatenated into one single CMC. The relevant uncertainty is then described with a table giving the complete set of uncertainty values. This facility was requested in December 2001 by the Electricity community.

As part of the publicity for the BIPM Key Comparison Database, the updated version of the KCDB leaflet was widely distributed over the year. The BIPM shared the NIST stand at the PITTCON Conference in New Orleans in March 2002 to publicise the database and MRA among the chemistry community. 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 and later at a joint BIPM-NPL Workshop in the UK in September 2002.

To help promote the benefits of participation in the Metre Convention and the CIPM MRA particularly for small and developing countries, I provided an article for the October 2002 issue of INFOSIM (the SIM Newsletter). This article has subsequently been re-drafted to become the "Letter to NMI Directors of States not yet Members of the Metre Convention or Associates of the CGPM", for distribution in January 2003 both to the identified NMI Directors and to the Embassies of relevant States in Paris.

The operation of the MRA continues to foster close collaboration between NMIs around the world, through memberships in Consultative Committees, CC Working Groups, RMO Technical Committees and Working Groups and the JCRB itself, as well as with staff of the BIPM. The credibility and effectiveness of the CIPM MRA are wholly dependent on the substantial work of these various parties, to whom I pay tribute.

The JCRB continues its schedule of two meetings in 2003, the first in March in Tsukuba at the invitation of APMP, and the second in October at the BIPM. The end of the transition period at the end of 2003 will no doubt lead to further evolution in the operation of the JCRB.

The degree of cooperation between RMO representatives to the JCRB continues to provide a strong foundation for the work of the JCRB, and I express my appreciation for their on-going enthusiasm and active participation.

T J Quinn
Chairman, JCRB. 28 March 2003.

Appendix E. Terms of reference of the Joint Committee of the Regional Metrology Organizations (RMOs) and the BIPM.

1 The Joint Committee is charged with

a) coordinating the activities among the RMOs in establishing confidence for the recognition of calibration and measurement certificates, according to the terms of the Mutual Recognition Arrangement (MRA);

b) making policy suggestions to the RMOs and to the CIPM on the operation of the MRA;

c) analysing the application by each RMO of the criteria of the MRA;

d) analysing and entering into Appendix C the proposals of each RMO in respect of the calibration and measurement capabilities of their member NMIs and reporting to the CIPM;

e) facilitating appropriate inter-regional supplementary comparisons;

f) writing an annual report on the activities of the Joint Committee to the CIPM and to the signatories of the MRA.

2 Membership and meetings of the Joint Committee

a) each RMO informs the Director of the BIPM of the name of its official representative on the Joint Committee;

b) at each meeting of the Joint Committee the representatives may be accompanied by appropriate advisors;

c) the Joint Committee operates by consensus;

d) the Joint Committee should meet at least once a year.

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24 November 1999

To:Chairman of Regional Metrology Organizations (RMOs)

Dear Colleague,

Provisional entries to Appendix C of the MRA

During the recent APMP General Assembly in Chinese Taipei, at which representatives of EUROMET and SIM were present, important discussions took place on matters related to the preparation of the provisional entries to Appendix C of the MRA. This letter is to inform you of these and to give you my views on how we can most effectively prepare for the JCRB meeting in March next year. The main points concern: (a) criteria for acceptance of provisional data for Appendix C; (b) the need for common names of services in each field; and (c) the timetable for entry of the data into Appendix C.

(a) Criteria for acceptance of provisional data for Appendix C:

Paragraph 11.3 of the MRA foresees provisional data for Appendix C until such time as the first round of key and supplementary comparisons has been completed and until the quality systems referred to in Paragraph 7 have been put in place. It is important to ensure a reasonable uniformity in the criteria used by the RMOs in submitting provisional data to the JCRB for entry into Appendix C. Discussion at the APMP General Assembly resulted in a consensus that the following points should be taken into account in evaluating such submissions.

- Results of key comparisons, supplementary comparisons and pilot comparisons (insofar as they exist)
- Results of past CC, RMO or other comparisons
- Results of informal bilateral comparisons
- Knowledge of activities by other NMIs
- Active participation in RMO projects
- Any accreditation, third party or self-declaration, including: the name of the accreditation body; membership of a multilateral agreement/arrangement; scope of accreditation; names of the peer reviewers
- Quality system existing or in preparation, documentary evidence
- Scientific and technical qualifications of staff
- Other available knowledge and experience, such as scientific publications and participation in scientific meetings and training activities

NMIs are encouraged to provide any additional information that will help in the evaluation by the RMO.

Clearly, the narrower the uncertainty claimed, the more specific and detailed must be the supporting evidence.

Note:

- Entries in Appendix C do not have to have a directly equivalent entry in Appendix B
- Appendix B is used to give general confidence in an NMI's capabilities in a wider field

In each RMO the Appendix C submission should be reviewed first by the RMO technical working group or technical committee, and then by a final RMO review process. Only then will it be passed to the JCRB.

(b) Lists of the names of services in each field:

In drawing up lists of calibration and measurement capabilities, it would be very helpful if the RMOs could agree on common lists of the names of services to be entered into the agreed Appendix C formats. Such agreement has already been reached in the field of length and detailed proposals in the field of electricity have been made by EUROMET.

I suggest that the appropriate Rapporteurs, Technical Committee Chairs or Working Group Chairs in each RMO be asked to contact their counterparts in the other RMOs with a view to harmonizing as far as possible the names of these services. I attach the names of these persons in each field for APMP, EUROMET and SIM and I invite the corresponding people in the other RMOs to make contact.

(c) Timetable for entry of data in Appendix C:

The JCRB at its meeting in Charlotte in July 1999 drew up a timetable for entry of provisional data into Appendix C. It is now clear that it will not be possible to meet this timetable for all fields or for all NMIs. There was common agreement during the recent APMP discussions that entries appearing in Appendix C must be properly reviewed within each RMO and that for some NMIs more time will be needed for this to be completed.

I fully support this view. We must give the RMOs the time necessary to carry out a serious review based on a set of agreed criteria such as those given above in (a). It is inevitable that for those NMIs that have not yet met the criteria given in Paragraph 7 of the MRA (c.f., also Paragraph 11.3), the entry of their data into Appendix C will not be immediate and will be sent to the JCRB for analysis only when such a review has taken place. This may take some time, but the end result will be much stronger; it will be reliable and have the status required of it by the MRA.

The next meeting of the JCRB will take place at the NIST as already agreed, on 20 and 21 March 2000. I envisage another meeting of the JCRB in October 2000. I suggest the 10, 11 and 12 October which is in the week preceding the CIPM and meeting of Directors of NMIs, which will take place in the week of 16 October 2000. It is probable that meetings of the JCRB will be convened at a similar frequency for the next few years.

Yours sincerely

T J Quinn
Director, BIPM,
and Chairman, JCRB

Enc.- Attached lists of Chairmen of RMOs, Rapporteurs of chairmen of working groups and technical committees of APMP, EUROMET and SIM.

To Chairmen of Regional Metrology Organizations **8 June 2000**

Dear colleague,

Entering the details and results of RMO key and supplementary comparisons into the BIPM key comparison database

This is to clarify the procedures for entering details and results of RMO comparisons into the BIPM key comparison database, Appendix B of the MRA. I take first the **past comparisons** which were completed and published before the MRA was signed and before the *Guidelines for CIPM key comparisons* had begun to be implemented (see paragraph 11.3 of the MRA) and then the **new key and supplementary comparisons** that are being carried out following the *Guidelines*.

1. Past comparisons: in this case all that is required is for the chairman of the RMO to send to the executive secretary of the appropriate CC at the BIPM the details of such past comparisons that the RMO wishes to be entered into the database in the usual format. For these comparisons the results do not appear in the database and no degrees of equivalence are calculated but the bibliographic reference is given to the publication where the results can be found. The publication cited must be one that is normally available to the public.

2. New key comparisons:
I refer you first of all to paragraphs T.9 and T.10 of the MRA in which the responsibilities of the RMOs in respect of key and supplementary comparisons are stated. These paragraphs deal with the purpose and technical requirements of key and supplementary comparisons initiated by the RMOs but do not mention the procedures to be used to enter details or the results of these comparisons in the BIPM key comparison database.

2.1 Starting an RMO key comparison: Following discussions at various key comparison Working Groups and at meetings of Consultative Committees (CCs), the procedure that I recommend is the following:

a) An RMO wishing to start a key comparison follows the procedures laid down in the *Guidelines for CIPM key comparisons* in respect of all the technical matters and ensures that the protocol is sufficiently close to that already used in the corresponding CIPM key comparison so that its results can be linked to those of the CIPM key comparison.
b) The protocol and details of the proposed RMO key comparison should then be sent to the chairman of the appropriate CC Technical Working Group (see CC directory on the BIPM web site) and to the executive secretary at the BIPM of the appropriate CC. If there is any doubt within the RMO as to whether or not its protocol is sufficiently close to that of the CIPM key comparison, the chairman of the appropriate CC technical Working Group should be consulted at an earlier stage to avoid problems later
c) The executive secretary will seek the necessary authorization from the chairman of the key comparison Working Group or other designated person to pass the details of the planned comparison to the coordinator of the BIPM key comparison database for entry as a planned key comparison.

2.2 Entering the results of an RMO key comparison into the database: When the RMO key comparison is completed, the results are sent to the chairman of the CC key comparison Working Group (or other designated Working Group) and to the executive secretary of the appropriate CC, with a statement from the RMO confirming that the key comparison has been carried out according to the *Guidelines* and that it meets all the requirements of paragraphs T.9 and T.10 of the MRA. Normally, the CC will have given authority to the chairman of its key comparison Working Group (or other designated Working Group) to scrutinize and pass such results on to the BIPM for entry into the database. If difficulties are encountered, the chairman will ask the CC for advice. The executive secretary will ensure that the President of the CC is kept informed.

3. Supplementary comparisons: The procedures for RMO supplementary comparisons are the same except that there is no requirement for compatibility between the protocol of the RMO supplementary comparison with that of any other. There is no inter-RMO coordination of supplementary comparisons, these are wholly the responsibility of the individual RMOs.

Finally, for us to be sure that the information we receive from RMOs is indeed the formal submission of data for the database, it would be helpful if it is sent to the BIPM by the chairman of the RMO or by a person designated by the chairman.

With my best regards
Yours sincerely
T.J. QUINN

JCRB statement on CMC evaluation

13 October 2000

The JCRB, at its meeting in October 2000, considered the experience gained so far in the evaluation of CMCs submitted by NMIs for inclusion in Appendix C of the MRA. The JCRB wishes to remind the RMO technical working groups of the aims and objectives of the MRA in this respect. The JCRB made the following statement:

The principal objective of the MRA is to facilitate international trade by promoting mutual recognition of calibration and measurement certificates in a broad range of application areas. Hence, the CIPM key comparisons are expected to be designed to give confidence for a broad range of calibration and measurement capabilities (CMCs), not just those supported directly by key comparisons. Therefore, the JCRB strongly recommends that the RMO technical working groups do not limit their reviews, even in the first instance, to the CMCs directly supported by key comparisons; all calibration and measurement capabilities submitted by NMIs for inclusion in the database should be included in the reviews as soon as possible. We draw your attention specifically to the JCRB rules of procedure for CMC entry into Appendix C adopted by the JCRB in October 2000.

JCRB Rules of Procedure for CMC entry into Appendix C

Revised October 2001

The Rules of Procedure of the JCRB adopted at its 2nd meeting in February 1999 specify the steps required for an NMI's calibration and measurement capabilities to be entered into Appendix C. These Rules were modified at the 5th meeting of the JCRB and put on the website as JCRB-5/1.

Since then, an interactive website has been created for RMO representatives to the JCRB to enter actions related to review of CMCs. It is also intended for other interested parties in the RMOs to be informed of the status of every CMC during the review process. This website may be viewed using the login names and passwords distributed to RMOs through their Representatives to the JCRB.

The creation of the website has led to some modifications to the procedure. The revised procedure is as follows:

(a) The NMI sends its draft CMCs to the local RMO for review and approval according to the JCRB and RMO criteria (see below for summary of criteria and JCRB statement).
(b) The local RMO sends the approved CMCs to Chairman of JCRB with appropriate formal statement on behalf of the RMO representative to the JCRB. Reception of these CMCs is acknowledged on the JCRB website with date.
(c) Chairman of JCRB forwards received CMCs to all other RMOs through their representative on the JCRB. This action is noted on the website with dates. RMOs indicate on the website whether or not they will review these CMCs and set date for completion of review.
(d) Inter-regional review takes place which includes direct contact between technical working group chairmen of RMOs; interim and final reports sent to Chairmen of their own RMO by each review team (see below for detailed rules on inter-regional review).
(e) Reports of reviews are sent through JCRB representatives to Chairman of JCRB with an official accompanying statement and he sends them on to chairmen of other RMOs. These actions are noted on the JCRB website with dates.
(f) NMIs revise their CMCs as necessary and re-submit to local RMO.
(g) RMOs send their revised CMCs to the Chairman of the JCRB with the appropriate formal statement stating that all issues raised in inter-regional review have been resolved.
(h) Chairman of the JCRB puts revised CMCs on the JCRB website setting a date not more than one month ahead for approval by RMOs. This and action (g) are noted on the website with dates.
(i) Provided all RMOs indicate their approval on the website, the CMCs are entered into Appendix C. This action is noted on the website with the date of entry.

Criteria for acceptance of data for Appendix C[1]

Paragraph 11.3 of the MRA foresees (provisional) data for Appendix C until such time as the first round of key and supplementary comparisons has been completed and until the quality systems referred to in Paragraph 7 have been put in place. It is important to ensure a reasonable uniformity in the criteria used by the RMOs in submitting data to the JCRB for entry into Appendix C. The Chairman of the JCRB sent a letter to Chairmen of RMOs on 24 November 1999 in which he gave a summary of the points that should be taken into account. These points have formed the basis of the individual documents drawn up by RMOs specifying in more detail the criteria to be used.

The JCRB at its fifth meeting in October 2000 reviewed these criteria and reviewed the separate procedure documents prepared by the individual RMOs. It found that the procedures of the different RMOs were in good agreement with each other and with the criteria of the letter of 24 November referred to above. For clarity, the JCRB decided to restate these criteria in a slightly different form and made the following statement:

[1] Please note that page 2 of this document, the "Criteria for Acceptance of data for Appendix C", was amended following the 8th JCRB Meeting (5-6 March 2002). The revised document is provided within the *JCRB Document*s Section, titled: "Criteria re Accepting Data for Appendix C".

The JCRB requires that the following points should be taken into account in evaluating CMC submissions:

1. Results of key and supplementary comparisons.
2. Documented results of past CCs, RMO or other comparisons (including bilateral comparisons).
3. Knowledge of technical activities by other NMIs.
4. Active participation in RMO projects.
5. Appropriate measurement procedures and equipment.
6. Scientific and technical qualifications of staff.
7. Other available knowledge and experience.
8. Quality system existing or in preparation, brief description.
9. Any peer assessment, third party accreditation or self declaration, including the name of the accreditation body; membership of a multilateral agreement/arrangement; scope of accreditation; names of peer reviewers.

The JCRB emphasized the importance of having a broad spread of information covering as far as possible all of these points. Before the results of key and supplementary comparisons are available, increased emphasis should be placed on points 2, 3 and 4 and particularly on the results of visits implied in 3. Before quality systems are fully in place item 7 takes on an increased importance and particularly the peer reviews mentioned in 9.

Procedures for inter-regional review of CMCs

The JCRB at its fifth meeting in October 2000 made the following statement concerning inter-regional reviews of CMCs:

Inter-regional reviews of CMCs are principally to ensure that the agreed JCRB and RMO procedures have been correctly applied; they also assist in harmonizing RMO review procedures.

The JCRB recommends:

- that this inter-regional review should be carried out by the corresponding RMO working groups for the field in question;
- that these working groups should make a written report to their RMO Chairman;
- that this report should include the names of the members of the review team;
- that the review includes the detailed examination of a small number of the proposed CMCs chosen to evaluate the more critical CMCs.
- that the final reports should be sent to the Chairman of the JCRB who sends them on to RMO representatives on the JCRB.

The JCRB accepts that not every RMO will wish to review the CMCs of all NMIs in every other RMO; however, to ensure a reasonable coverage of review the JCRB recommends that the technical working groups of each RMO make contact and come to an agreement on sharing the task.

During the review process the JCRB recommends that communication is established directly between the appropriate working group chairmen to deal with questions and resolve, as far as possible, inconsistencies. Unresolved problems or disagreements that cannot be resolved by the technical experts must come to the RMOs and, if necessary, to the JCRB as foreseen in the MRA.

BIPM INSTRUCTIONS FOR DRAWING UP CMC EXCEL FILES

6th JCRB meeting, 8-9 March 2001

Introduction

On 13 December 2000, the BIPM launched the Appendix C database onto the Web with the so-called "top-services" in the domain of Length. Since then, it has been growing steadily in size with the publication of Calibration and Measurement Capabilities in the domain of Electricity and Magnetism. To achieve this a huge amount of work was invested by the laboratories and the BIPM. From the experience gained, it appears that very detailed instructions would be useful for those in the process of listing their CMCs. The aim of the present note is to give sufficiently detailed instructions so as to avoid mistakes that may otherwise occur when the BIPM imports CMC files into the database. They replace those drafted by Dr R. Watters after the 4th JCRB meeting, take into account the decisions made at the 5th JCRB meeting, and give detailed editorial guidance. This note is dated "March 2001", but it may well be that further experience in other areas of metrology will indicate a need for additional advice with regard to the preparation of CMCs that have not yet been submitted to the JCRB.

According to requirements expressed at the 5th JCRB meeting, the BIPM Appendix C database should make available to users two different ways for accessing information contained in CMC files:

1. The database should provide .pdf files listing all CMCs declared by one country for one metrology area.
2. The database should provide a search engine that returns CMCs corresponding to a selected service.

The BIPM Appendix C database provides information contained in the "white part" of the CMC Excel files, namely "Calibration and measurement service", "Measurand level or range", "Measurement conditions/independent variable", "Expanded uncertainty", and in the column of comments on the CMC lines. Three additional columns are also needed: the yellow column including the NMI acronym, the yellow column including the NMI service identifier, and the yellow column including the service number drawn up from the Classifications of Services agreed among the RMOs for each metrology area. The remaining columns, especially the "blue part" and any additional columns of information useful for the regional and inter-regional review are for internal RMO use only. It follows that these instructions concern only the "white part" of CMC Excel files and the three columns mentioned above. This constitutes the "useful part of the file" in the text given below.

These instructions do not apply to the CMC files of Length designated "top-services", which are already published, or to the final submissions in Electricity and Magnetism, which were sent to the BIPM in December 2000, and January and February 2001. They should be applied, however, to all other CMC files now under review or to be drawn up in future.

Instructions (March 2001)

The BIPM would be most appreciative if contributors to Appendix C would take note of the following points when preparing CMC Excel files:

1. Following the 5th JCRB decision to present CMCs by countries rather than by NMIs, **use one Excel file per country and per metrology area**. This Excel file may include several worksheets, but all CMCs should be listed in one single worksheet for all branches of the metrology area, the additional worksheets being used for information needed in the intra- or inter-regional review.
2. Since the search engine of the database relies upon the Classification of Services, care should be taken to **use the most recent list of services** agreed among the RMOs for choosing the service numbers. **THIS IS THE MOST IMPORTANT INSTRUCTION OF ALL**.
3. **Translate all words into English**.
4. **Use the period "." as the decimal separator** rather than a comma "**,**".
5. **Choose the setting "text" for all the cells of the useful part of the file. Do not choose "percentage" or "scientific".** Formatting all cells in text ensures that information is safely imported into the database. In addition, as mentioned below, it does not prevent, and even often simplifies, the writing of statements such as "95%" or "4.25E-03".
6. Format all the cells of the useful part of the file in "**Center**" and "**Wrap text**".
7. Use by default the font "**Arial 10**" and not "Times new roman 10 or 12". The "**µ**" is obtained directly from your keyboard or by typing "**ALT+0181**" and the "**±**" by typing "**ALT+0177**". Greek letters cannot be written in "Arial 10": use instead "**Symbol 10**" for these special characters (for instance for "**Ω**", "ϕ", etc.). Avoid using any other fonts than the two cited here.
8. **Italics should be used for quantities** (for instance "L" for a length), **but never for units**.
9. For cells including words (for instance the column describing the method), avoid abbreviation (for instance write "relative" instead of "rel.") and **the wording should always begin with a capital letter but no other capital letters should be used in the same cell, except if an acronym is to be given** (for instance "**Relative AC/DC voltage difference**", but not "Relative AC/DC Voltage Difference"). This applies to all cells except those giving the specifications of parameters, which should never begin with a capital letter (this case is very rare since the parameter specifications generally consist of value ranges).
10. Be careful with the insertion of blank characters into cells. Blank characters should be used only to separate words (for instance "**AC/DC voltage difference**"), to separate a number from its unit (for instance "**20 °C**"), after a colon "**:**" and a comma "**,**" (such as "**Length: central length, L**") but never preceding a colon or comma. All other blank characters should be deleted, even if it slightly degrades the presentation (for example, do not write "1 mm, 10 mm, 100 mm" to make the "100 mm" appear well-centred in the cell.
11. **Never use the semicolon ";" inside a cell** (this may be interpreted as a cell separator when importing the file into the database). You can, however, use the colon "**:**" and the comma "**,**".
12. **Do not imbed returns, spaces or tabs in a single cell to force word wrapping**, even if it appears to improve the presentation. In particular, never use the function "Alt+Return" (it inserts a "carriage return" inside an Excel cell).
13. **Multiple entries in a single cell must be separated vertically into separate cells and cells must not be merged vertically**. This holds specially when the description of one CMC is valid for different measurand ranges and/or includes several parameters with their specifications. In these cases:
    - use only one measurand range per CMC and repeat all other relevant information;
    - place each parameter and specification in its own cell.

    See examples at the end of this document.
14. **Superscripts and subscripts can be used, but not for numbers** (especially not for powers of ten, see instruction 17). Superscripts can be used in the expression of units such as "**m/s^2**". Subscripts can be used in quantities such as "H_{CB}".
15. A blank character may be used in a complicated unit [for example "**µW/(V A)**"]. In such a case the blank character may be used but is not necessary. Avoid using the "dot above the line" (Alt+0149) which has the meaning of "multiplication" of units (this character is not accepted by the database; better to insert a blank character or nothing at all).
16. **If a unit like "dB" needs a reference value, include it in column B "Instrument or Artefact"** under the form: "**Reference value for the unit: 1 µV**".
17. **Use as often as possible the scientific notation "YE-XX" when writing numbers, especially powers of ten**. Note that since the cells are defined as "text" the characters "Y", "E" and "-XX" are sequentially typed without defining any other settings such as the number of decimals. The part "**Y**" may be a number including decimals; the point "**.**" should be used as the decimal separator (for example "**1.0E-09**" does not convey the same meaning as "**1E-09**" since an additional decimal is given in the first case). **Do not separate**

the part "Y" from the part "E-XX" by a blank or any other character. **Always write the part "-XX" with three characters (and not two)**: a "**-**" or "+" sign and two integers (for instance, avoid writing expressions such as "1E-9" for "**1E-09**", or "4.23E04" for "**4.23E+04**"). The sign "-" is obtained in Arial as a short dash.

18. **Do not use "±" in the uncertainty column**, "±" is reserved for ranges in the specification of parameters.
19. The part "Expanded uncertainty" should at least be divided into five columns corresponding to the headings "Value", "Unit", "Coverage factor", "Level of confidence", and "**Is the expanded uncertainty a relative one?**" (the introduction of this last column was decided at the 5th JCRB). Answer this question in the CMC lines by inserting "**Yes**" or "**No**". A blank entry with no answer to the question cannot be accepted. Note that in Chemistry, the part "Value" is split into two columns "From" and "To".
20. Do not use a blank character in the multiplication of a number by a quantity (thus "**0.24*L***" and not "0.24 *L*").
21. It may happen that the expanded uncertainty is a function of a quantity. In such a case, **be sure to define the quantity and its symbol in a previous cell of the CMC line and specify the unit**. This unit should be by default the unit given for the measurand range, but this has not always proved to be the case; it is obligatory that the unit be given explicitly (thus "Q[20, 0.24*L*]" should be written as "**Q[20, 0.24*L*], *L* in mm**" with "*L*" defined in another cell, for instance in column B, "**Gauge block: central length *L***").
22. Parameters are often specified as a range of values. **Use the ISO standard presentation for value ranges: the unit should be given at both ends of the range**. In addition use "**to**" instead of "**-**" as the "-" may be interpreted as the "minus" sign (for example the specification of the parameter "Frequency", "10 - 20 Hz", should be written as "**10 Hz to 20 Hz**").
23. It was suggested that a typical range of values be given for the expanded uncertainty when this uncertainty is expressed as a function. This can be particularly informative, especially when the uncertainty value depends upon a number of parameters. Experience gained from the CMCs already published shows, however, that this is not often done and that some calculation errors were incurred in computing both ends of the values' range. This thus remains an option, but there is no obligation in this regard. **If a range of uncertainty values is given, it is important that it be computed correctly** (as no checks are made at the BIPM) **and that the unit of both limits of the range be given** (see point 22 above). Thus "Q[20, 0.24*L*], *L* in mm, values range from 20 to 31" should be written as "**Q[20, 0.24*L*], *L* in mm, values range from 20 nm to 31 nm**" ("*L*" being defined in another cell).
24. The level of confidence should be written as a percentage (such as "**95%**") and not as the number "0.95". **Since all cells should have been previously defined in "text", this result is obtained by typing "9" "5" "%" without inserting any blank character**.
25. **Check that the NMI acronym is given for all the CMC lines included in the file**. The NMI acronym should be written with no blank character added before or after the acronym. Blank characters may be added inside the acronym if the acronym is composed of two or more words. A hyphen can be inserted in the acronym (such as "CSIR-NML"); adding blank characters before and after the hyphen is a choice that the laboratory should make. Once the acronym is chosen, it should be unique and always written in the same way (as an example, the database would interpret "CSIR-NML" and "CSIR - NML" as two different laboratories).
26. Each laboratory can choose how to identify its internal service identifiers. The NMI internal service identifiers are often given by a simple number (for instance "23"), which is fine. It may also correspond to the identifiers of the catalogue of services provided by the laboratory (and often available via its website). An internal identifier that includes blank characters or a series of words (as is the case currently in Chemistry) should be avoided**.**
27. **It is imperative that the service numbers refer to services which are actually listed in the Classification of Services of the relevant metrology area** (see point 2). A service number is usually presented as "**a.b.c**", where "**a**", "**b**", and "**c**" are integers (for instance "**2.1.3**"). Sometimes it includes only two integers (as in Chemistry), or an additional identifier ("Co-60" for "Cobalt 60" as in the field of Ionizing Radiation); this depends on the agreed Classification of Services. In any case, **only 1 service number** should be written in the appropriate cell. If the CMC line corresponds to two services of the Classification, then either one single service number is actually adequate for the cited service, or the Classification is not precise enough; in the latter case the CMC line should be repeated twice with two different service numbers. **Do not add any blank character before, within or after the service number** (thus "2.1. 3" is forbidden).
28. **The cell of comments on the CMC line is published via the database. These comments, inserted in a white cell, should not be confused with review comments that are inserted in blue or yellow cells**. The comments to be published may include a complete sentence or a simple series of words. It should begin with a capital letter, should include no other capital letters (except acronyms), may include a period "." and a comma "," but the semicolon ";" should be avoided. It can also include the URL address of a website. In such a case, the link will be inserted by the BIPM (see the example of CMCs in Length from the BNM on the BIPM Appendix C Website). **Never use footnotes for information to be published via the database**.

29. All header/foot notes inserted in CMC Excel sheets are not used for the database. On the contrary, they are all suppressed for construction of the .pdf files and replaced by "Calibration and Measurement Capabilities", "The BIPM key comparison database", and the page numbering. RMOs may thus decide upon their own header/foot notes for the identification of their Excel sheets (for example, the date of the internal RMO review and the arrangement of pages).
30. Information included in the blue and yellow cells relevant to a given CMC may include several items. Write all items in the same cell or **use other cells on the same line**. This would activate new columns of the CMC line and has no impact on the importation of the CMC into the database. **In general, do not add artificial lines to a CMC for notes, references, or special specifications; always add columns for this purpose**.

Conclusions

We request that all the above rules be followed to ensure the reliability of the information included in the part "Appendix C" of the BIPM key comparison database.

Nevertheless, importing CMC Excel files into the database requires that database keys be constructed from the service numbers in order to operate the database search engine. The BIPM must necessarily, therefore, intervene in the column containing these numbers.
In addition, specific characters (Italics, Greek letters, subscripts, etc.) cannot be correctly handled by the Website if they are not transformed into HTML. The BIPM must, therefore, read the files and make the necessary arrangements for these specific characters. Precautions are taken when interfering with the definitive CMC files but human error is always possible. A careful check is thus done after the file is imported. It consists of comparing the "Web return" with the final CMC files as they have been sent to the BIPM. Again, mistakes are still a possibility.

We invite you to check your CMCs as they appear on the Web. In the future, restricted access to our prototype database may be given for a short time to those who are willing to check their CMCs before the launch of the database onto the international Web.

Parameters and Specifications

Calibration or Measurement Service			Measurand level or Range			Measurement Conditions/Independent Variable		Expanded uncertainty				
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**
Encapsulated source strength	Radioactive source	Ionization chamber	0	0.1	Gy/s	Temperature Pressure Relative humidity	22.0 °C 101.325 kPa 20% to 80%	0.01		2	95%	Yes

Calibration or Measurement Service			Measurand level or Range			Measurement Conditions/Independent Variable		Expanded uncertainty				
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**
Encapsulated source strength	Radioactive source	Ionization chamber	0	0.1	Gy/s	Temperature	22.0 °C	0.01		2	95%	Yes
						Pressure	101.325 kPa					
						Relative humidity	20% to 80%					

Each parameter and specification in its own cell.

Angle by circle-dividers	Optical polygon: face angle	Index table & autocollimator, full closure	360/n n = 24	360/n n = 3	°	n, number of faces	3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24	0.15	"	2	95%	Yes

But this example is correct, since these are distinct values for a single parameter.

Different measurand ranges

Calibration or Measurement Service			Measurand level or Range			Measurement Conditions/Independent Variable		Expanded uncertainty				
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage factor**	**Level of Confidence**	**Is the expande uncertaint relative or**
Luminous intensity	Tungsten lamp	Network of lamps & photometers, photometric bench	0.001 1 1000 -	1 1000 100000	cd	Distribution temperature	2000 K to 3200 K	1.5 to 0.4 0.4 0.4 to 1.5 with measurand	%	2	95%	Yes

Calibration or Measurement Service			Measurand level or Range			Measurement Conditions/Independent Variable		Expanded uncertainty				
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage factor**	**Level of Confidence**	**Is the expanded uncertainty relative one**
Luminous intensity	Tungsten lamp	Network of lamps & photometers, photometric bench	0.001	1	cd	Distribution temperature	2000 K to 3200 K	1.5 to 0.4	%	2	95%	Yes

Luminous intensity	Tungsten lamp	Network of lamps & photometers, photometric bench	1	1000	cd	Distribution temperature	2000 K to 3200 K	0.4	%	2	95%	Yes
Luminous intensity	Tungsten lamp	Network of lamps & photometers, photometric bench	1000	100000	cd	Distribution temperature	2000 K to 3200 K	0.4 to 1.5	%	2	95%	Yes

No vertical cells merging

Individual measurand levels and uncertainties must have separate complete lines

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty					Reference St used in calib	
Quantity	**Instrument or Artifact**	**Instrument Type or Method**	**Minimum value**	**Maximum value**	**Units**	**Parameter**	**Specifications**	**Value**	**Units**	**Coverage factor**	**Level of Confidence**	**Is the expanded uncertainty a relative one?**	**Standard**	**So tra**
Gas flow	Gas flow meters	Sonic nozzles, turbine	0.05	50	L/min	Fluid Temperature Pressure	dry air 19 °C to 21 ºC up to 0.8 MPa	0.2	%	2	95%	Yes	Piston-Prover	C
			50	710				0.3	%				Bell-Prover	
			710	2800				0.3	%				Bell-Prover	

Bo blank lines.

Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Standard	So tra
Gas flow	Gas flow meters	Sonic nozzles, turbine	0.05	50	L/min	Fluid	dry air	0.2	%	2	95%	Yes	Piston-Prover	C
						Temperature	19 °C to 21 °C							
						Pressure	up to 0.8 MPa							
Gas flow	Gas flow meters	Sonic nozzles, turbine	50	710	L/min	Fluid	dry air	0.3	%	2	95%	Yes	Bell-Prover	C
						Temperature	19 °C to 21 °C							
						Pressure	up to 0.8 MPa							
Gas flow	Gas flow meters	Sonic nozzles, turbine	710	2800	L/min	Fluid	dry air	0.3	%	2	95%	Yes	Bell-Prover	C
						Temperature	19 °C to 21 °C							
						Pressure	up to 0.8 MPa							

No vertical cells merging. Repeat all relevant information for each

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21 January 2002

ADDITIONAL INSTRUCTIONS FOR CMCs FILES IN EM

Two new possibilities are now offered for simplifying the presentation of CMCs EXCEL files in Electricity and Magnetism. This may also apply to other fields.

1. Uncertainty matrices

A huge number of CMC lines may be gathered into one or few CMC lines in the case when the uncertainty is better described by a matrix rather than by a single range of values. For instance, AC/DC voltage transfer uncertainty often takes the form of a matrix assigning one uncertainty value to one voltage and one frequency. A procedure was designed by the BIPM, aiming to allow this matrix presentation.
The detailed instructions may be found in the example file:
'Instructions_for_uncertainty_matrices_in_CMC_files.xls'.
Roughly speaking, it consists of adding one column in the EXCEL main worksheet template, inside which the title of the relevant matrix is inserted. The matrix itself is given in an additional worksheet of the EXCEL file, the tab of which reproduces exactly the title of the matrix given in the additional column. The EXCEL file will thus include as many additional worksheets as there are matrices announced in the main worksheet.

2. Closely related CMCs

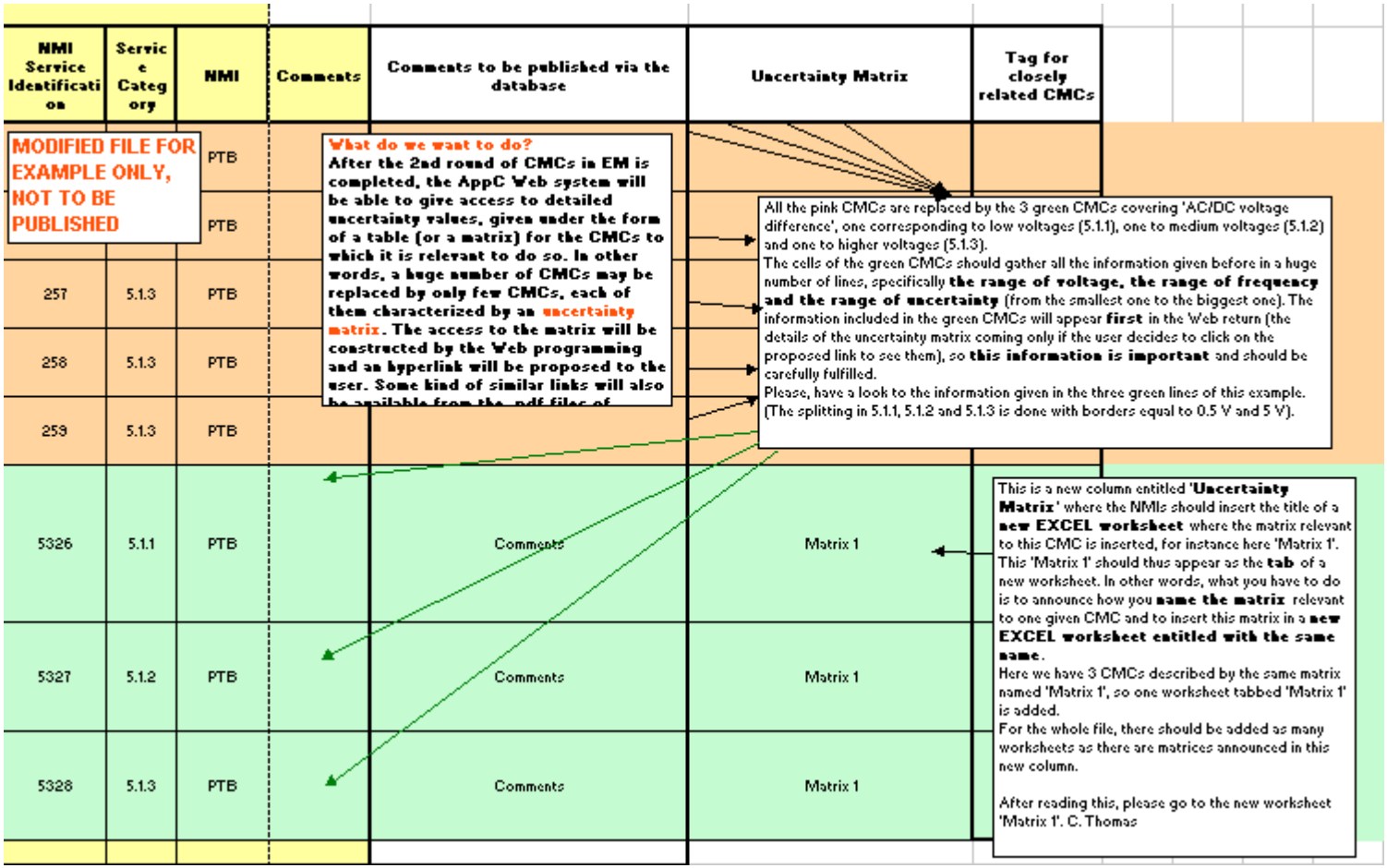
It may happen that two CMCs are closely related. For instance, the real component and the imaginary component of an AC resistance, even if placed into two different CMCs, should appear close-by when returned by the KCDB Web programming. A procedure was designed by the BIPM, aiming to identify these closely related CMCs.
The detailed instructions may be found in the example file:
'Instructions_for_closely_related_CMCs.xls'.
Roughly speaking, it consists of adding one column in the EXCEL main worksheet template, inside which the same tag is inserted for the closely related CMCs.
Note. Following the modified classification being discussed within the CCEM, real and imaginary parts of the same quantity will have the same classification number. This will help in presentation but will not assure, by itself, that two closely related CMCs will appear close-by. The technique described here must be used.

Conclusions

Handling the cases of uncertainty matrices and of closely related CMCs requests the addition of two new columns in the EXCEL main worksheet template already in use for CMCs in Electricity and Magnetism, as well as additional EXCEL worksheets including the uncertainty matrices. If a given CMC is not described by an uncertainty matrix, the relevant cell remains empty. If a given CMC is independent from all others, the relevant cell remains empty.

INSTRUCTIONS FOR UNCERTAINTY MATRICES IN CMC FILES

Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a	Standard	Source of traceability	
AC/DC transfer difference at higher voltages	Thermal voltage converters + range extenders	Comparison	1000	1000	V	Frequency	400 Hz to 10 kHz	20	µV/V	2	95%	Yes	Multijunction thermal converters with range resistors	PTB	CCEM-K6b
AC/DC transfer difference at higher voltages	Thermal voltage converters + range extenders	Comparison	1000	1000	V	Frequency	20 kHz to 30 kHz	25	µV/V	2	95%	Yes	Multijunction thermal converters with range resistors	PTB	CCEM-K6b
AC/DC transfer difference at higher voltages	Thermal voltage converters + range extenders	Comparison	1000	1000	V	Frequency	50 kHz	40	µV/V	2	95%	Yes	Multijunction thermal converters with range resistors	PTB	CCEM-K6b
AC/DC transfer difference at higher voltages	Thermal voltage converters + range extenders	Comparison	1000	1000	V	Frequency	70 kHz	60	µV/V	2	95%	Yes	Multijunction thermal converters with range resistors	PTB	CCEM-K6b
AC/DC transfer difference at higher voltages	Thermal voltage converters + range extenders	Comparison	1000	1000	V	Frequency	100 kHz	80	µV/V	2	95%	Yes	Multijunction thermal converters with range resistors	PTB	CCEM-K6b
AC/DC voltage difference	Thermal voltage converters with amplifiers, micropotentiometers	Comparison	0.002	0.5	V	Frequency	10 Hz to 1 MHz	3 to 350	µV/V	2	95%	Yes	Multijunction thermal converters with range resistors	PTB	CCEM-K6b
AC/DC voltage difference	Thermal voltage converters	Comparison	0.5	5	V	Frequency	10 Hz to 1 MHz	2 to 30	µV/V	2	95%	Yes	Multijunction thermal converters with range resistors	PTB	CCEM-K6b
AC/DC voltage difference	Thermal voltage converters + range extenders	Comparison	5	1000	V	Frequency	10 Hz to 1 MHz	2 to 80	µV/V	2	95%	Yes	Multijunction thermal converters with range resistors	PTB	CCEM-K6b


NMI Service Identification
Service Category
NMI
Comments
Comments to be published via the database
Uncertainty Matrix
Tag for closely related CMCs
MODIFIED FILE FOR EXAMPLE ONLY, NOT TO BE PUBLISHED
PTB
PTB
257 5.1.3 PTB
258 5.1.3 PTB
259 5.1.3 PTB
What do we want to do?
After the 2nd round of CMCs in EM is completed, the AppC Web system will be able to give access to detailed uncertainty values, given under the form of a table (or a matrix) for the CMCs to which it is relevant to do so. In other words, a huge number of CMCs may be replaced by only few CMCs, each of them characterized by an uncertainty matrix. The access to the matrix will be constructed by the Web programming and an hyperlink will be proposed to the user. Some kind of similar links will also
All the pink CMCs are replaced by the 3 green CMCs covering 'AC/DC voltage difference', one corresponding to low voltages (5.1.1), one to medium voltages (5.1.2) and one to higher voltages (5.1.3).
The cells of the green CMCs should gather all the information given before in a huge number of lines, specifically the range of voltage, the range of frequency and the range of uncertainty (from the smallest one to the biggest one). The information included in the green CMCs will appear first in the Web return (the details of the uncertainty matrix coming only if the user decides to click on the proposed link to see them), so this information is important and should be carefully fulfilled.
Please, have a look to the information given in the three green lines of this example.
(The splitting in 5.1.1, 5.1.2 and 5.1.3 is done with borders equal to 0.5 V and 5 V).
5326 5.1.1 PTB Comments Matrix 1
5327 5.1.2 PTB Comments Matrix 1
5328 5.1.3 PTB Comments Matrix 1
This is a new column entitled 'Uncertainty Matrix' where the NMIs should insert the title of a new EXCEL worksheet where the matrix relevant to this CMC is inserted, for instance here 'Matrix 1'. This 'Matrix 1' should thus appear as the tab of a new worksheet. In other words, what you have to do is to announce how you name the matrix relevant to one given CMC and to insert this matrix in a new EXCEL worksheet entitled with the same name.
Here we have 3 CMCs described by the same matrix named 'Matrix 1', so one worksheet tabbed 'Matrix 1' is added.
For the whole file, there should be added as many worksheets as there are matrices announced in this new column.
After reading this, please go to the new worksheet 'Matrix 1'. C. Thomas

	10 Hz	20 Hz	30 Hz to 300 Hz	400 Hz to 10 kHz	20 kHz to 30 kHz	50 kHz	70 kHz	100 kHz	200 kHz to 300 kHz	500 kHz	700 kHz to 800 kHz	1 MHz
2 mV	180	170	170	170	180	180	180	190	230	250	320	350
6 mV	120	100	95	90	100	100	100	120	160	180	250	300
10 mV	80	80	65	65	80	80	80	100	135	150	220	250
20 mV	75	60	50	50	60	60	60	70	110	135	185	200
60 mV	65	45	45	35	45	45	45	50	70	100	140	150
100 mV / 200 mV	35	20	20	10	20	20	20	30	50	75	100	120
300 mV / 500 mV	10	10	10	3	4	4	4	4	10	15	25	30
600 mV / 700 mV	5	5	5	3	4	4	4	4	10	15	25	30
1 V / 2 V	4	4	4	2	2	3	3	3	6	10	20	25
3 V / 4 V	6	6	6	3	3	3	3	3	6	10	20	25
5 V / 6 V	4	4	4	2	2	3	3	3	6	10	20	25
7 V	4	4	4	4	4	4	4	4	6	10	20	25
10 V	6	6	6	4	4	4	4	6	8	12	20	30
20 V	15	10	10	6	6	6	7	10	15	20	25	35
30 V	15	10	10	10	10	10	10	10	15	25	35	40
40 V / 50 V	20	15	15	10	10	10	15	15	-	-	-	-
60 V / 70 V	25	20	20	10	10	10	15	20	-	-	-	-
100 V	25	20	20	10	10	10	15	20	-	-	-	-
200 V	30	20	20	10	10	10	20	25	-	-	-	-
300 V	30	20	20	15	15	15	20	25	-	-	-	-
500 V	40	30	30	20	20	20	30	40	-	-	-	-
1000 V	50	40	30	20	25	40	60	80	-	-	-	-

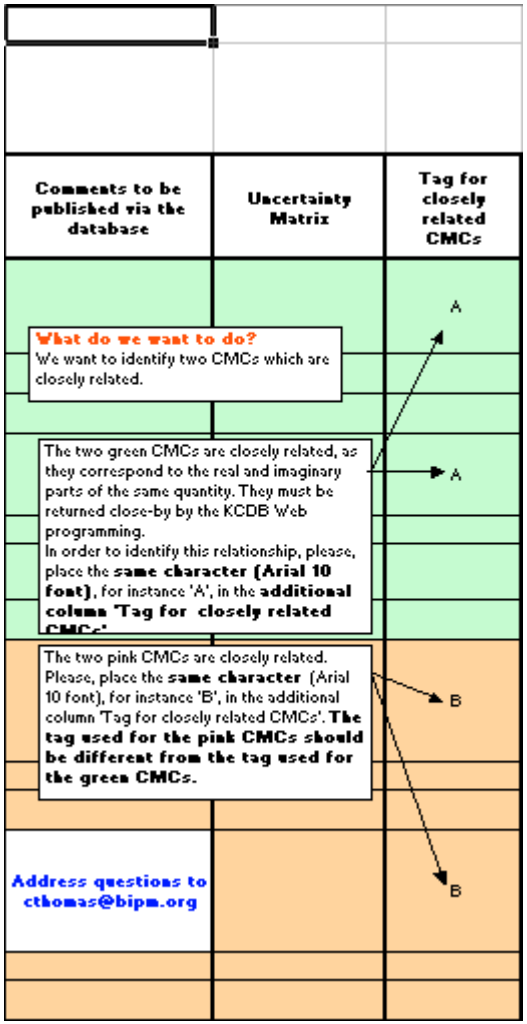
Please build the matrix as done here.
Use **Arial 10** as much as possible, **do not merge** cells, and leave **cell A1 empty (these 3 statements are very important)**.
Do not insert empty columns or empty lines in the matrix.
Do not insert titles: they will be automatically inserted from the description of the CMC.
For the uncertainty values, use the same unit as the one inserted in the uncertainty unit cell of the CMC line.
Use the most simple presentation as possible (no 'exotic' borders, colours, etc..).
If no uncertainty value is available for one cell of the matrix, insert an hyphen '-' in the cell.

COMMENTS: EXAMPLE ONLY: NOT TO BE PUBLISHED

You can type any comments that may help me below the matrix (leave at least one line empty). These comments **will not** be imported into the database: that's only for communication between the NMIs and me. Comments to be published via the database should be inserted in the usual 'Comments' cell of the CMC itself.
C. Thomas

Address any questions to cthomas@bipm.org

INSTRUCTIONS FOR CLOSELY RELATED CMCS																			
Calib	MODIFIED FILE FOR EXAMPLE ONLY, NOT TO BE PUBLISHED		Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty					Reference Standard used in calibration		List of Comparisons supportiong this measurement/ calibration service	Euromet Electricity Services Administration			
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a	Standard	Source of traceability		NMI Service Identification	Service Category	NMI	Comments
AC resistance: real component	Fixed resistor or decade resistance box	Comparison with AC reference resistor	0.1	1E+05	Ω	Frequency	400 Hz	10	μΩ/Ω	2	95%	Yes	AC standard resistor KR1 to KR5	PTB	[Internal]	47	4.1.1	PTB	
						Maximum voltage	10 V												
						Maximum current	0.5 A												
AC resistance: time constant	Fixed resistor or decade resistance box	Comparison with AC reference resistor	0	1	μs	Resistance	0.1Ω to 100 kΩ	0.001	μs	2	95%	No	bifilar loop with calculable time constant	PTB	[Internal]	48	4.1.1	PTB	
						Frequency	400 Hz												
						Maximum voltage	10 V												
						Maximum current	0.5 A												
High voltage impedance: burdens, real component	Standard burden for instrument transformer	Impedance measuring set	0.01	10000	Ω	Current	0.05 A to 10 A	1E-03 to 1E-02	Ω/Ω	2	95%	Yes	impedance measuring set	PTB	[Internal]	398	8.2.3	PTB	
						Voltage	10 V to 320 V												
						Frequency	16.7 Hz, 50 Hz, 60 Hz												
High voltage impedance: burdens, imaginary component	Standard burden for instrument transformer	Impedance measuring set	-1.57	1.57	rad	Current	0.05 A to 10 A	1 to 10	mrad	2	95%	No	impedance measuring set	PTB	[Internal]	399	8.2.3	PTB	
						Voltage	10 V to 320 V												
						Frequency	16.7 Hz, 50 Hz, 60 Hz												


Comments to be published via the database
Uncertainty Matrix
Tag for closely related CMCs
What do we want to do?
We want to identify two CMCs which are closely related.
The two green CMCs are closely related, as they correspond to the real and imaginary parts of the same quantity. They must be returned close-by by the KCDB Web programming.
In order to identify this relationship, please, place the same character (Arial 10 font), for instance 'A', in the additional column 'Tag for closely related CMCs'
The two pink CMCs are closely related. Please, place the same character (Arial 10 font), for instance 'B', in the additional column 'Tag for closely related CMCs'. The tag used for the pink CMCs should be different from the tag used for the green CMCs.
Address questions to cthomas@bipm.org
A
A
B
B

Procedure for modifying CMCs already in Appendix C

Modifications of a published CMC usually arise for reasons falling into one of three categories:

a) material or editorial errors and improvements to the explanatory text for a quantity, instrument, method etc.;
b) increase of the uncertainty or reduction in scope, decided by the NMI or following a comparison result;
c) change of the method of measurement or reduction of the uncertainty or increase in scope.

Modifications under category a) do not change the essence of the CMC (instrument, range of the quantity and of the parameters, method, uncertainty, traceability) but improve its content for the benefit of the user. For this category of modifications, the internal and the inter-RMO reviews are unnecessary. The NMI will send its proposal for change to the Technical Committee (TC) chairperson of its RMO, who will contact the coordinator of the BIPM database.

Modifications under category b) may be requested, for example, by an NMI wanting to reduce its engagement in the particular measurement activity or they may follow from a comparison result showing a significant unresolved deviation from the key comparison reference value (see Note 2). Also for this category internal and inter-RMO reviews are not needed and that the proposal for change is received by the TC chairperson and transmitted to the coordinator of the BIPM data base. However, in case that the change was originated by a comparison result, the TC chairperson should verify that the reduction in scope or the increase of the uncertainty is sufficient to assure the equivalence of the measurements. It is desirable in this case that the relevant RMO (or the BIPM) informs the other RMOs of the changes and their motivation.

Modifications under category c) should follow the full procedure of internal and inter-RMO review, as if they were new CMCs.

Note 1. To avoid overloading the BIPM, it is advisable not to submit individual modifications but to group a number of them together. Modifications should be made to the CMC EXCEL file already prepared for publication by the coordinator of the BIPM database and must be made clearly visible by the use of the following colour code:

- bold red characters for corrections to be brought to a published CMC and for presenting a new CMC not yet published
- highlighting with a light pink background a CMC that should be deleted, the words "to be deleted from the KCDB" should also be placed in the "comments" column of the CMC.

Note 2. The MRA, in paragraph T.7, states that "... *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. 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...."*

Criteria for acceptance of data for Appendix C[1]

Paragraph 11.3 of the MRA foresees (provisional) data for Appendix C until such time as the first round of key and supplementary comparisons has been completed and until the quality systems referred to in Paragraph 7 have been put in place. It is important to ensure a reasonable uniformity in the criteria used by the RMOs in submitting data to the JCRB for entry into Appendix C. The Chairman of the JCRB sent a letter to Chairmen of RMOs on 24 November 1999 in which he gave a summary of the points that should be taken into account. These points have formed the basis of the individual documents drawn up by RMOs specifying in more detail the criteria to be used.

The JCRB at its fifth meeting in October 2000 reviewed these criteria and reviewed the separate procedure documents prepared by the individual RMOs. It found that the procedures of the different RMOs were in good agreement with each other and with the criteria of the letter of 24 November referred to above. For clarity, the JCRB decided to restate these criteria in a slightly different form and made the following statement:

The JCRB requires that the following points should be taken into account in evaluating CMC submissions:

10. Results of key and supplementary comparisons.[2]
11. Documented results of past CCs, RMO or other comparisons (including bilateral comparisons).
12. Knowledge of technical activities by other NMIs.
13. Active participation in RMO projects.
14. Appropriate measurement procedures and equipment.
15. Scientific and technical qualifications of staff.
16. Other available knowledge and experience.
17. Quality system existing or in preparation, brief description.
18. Any peer assessment, third party accreditation or self declaration, including the name of the accreditation body; membership of a multilateral agreement/arrangement; scope of accreditation; names of peer reviewers.

The JCRB emphasized the importance of having a broad spread of information covering as far as possible all of these points. Before the results of key and supplementary comparisons are available, increased emphasis should be placed on points 2, 3 and 4 and particularly on the results of visits implied in 3. Before quality systems are fully in place item 7 takes on an increased importance and particularly the peer reviews mentioned in 9.

[1] This Document, arising from the 8th JCRB Meeting (5-6 March 2002), replaces the second page of Document JCRB-7/1, "JCRB Rules of Procedure for CMC Entry into Appendix C".

[2] *NMIs that have not yet taken part in key or supplementary comparisons are required as a minimum to have traceability of their national standards established through calibration by an NMI that has established its degree of equivalence through participation in the key comparison programs; they must also have participated in some bilateral comparisons in addition to meeting the other criteria listed here.*

END OF TRANSITION PERIOD OF CIPM MRA – REVIEW OF PUBLISHED CMCs

During the transition period, many NMIs are in the process of participating in comparison programs and establishing their quality systems. Thus, CMCs being published during this period are based on fulfilment, *as far as possible*, of the criteria given in the Document JCRB-8/13(1b) "Criteria for acceptance of data for Appendix C". For convenience these criteria are copied below:

1. Results of key and supplementary comparisons.[1]
2. Documented results of past CCs, RMO or other comparisons (including bilateral comparisons).
3. Knowledge of technical activities by other NMIs.
4. Active participation in RMO projects.
5. Appropriate measurement procedures and equipment.
6. Scientific and technical qualifications of staff.
7. Other available knowledge and experience.
8. Quality system existing or in preparation, brief description.
9. Any peer assessment, third party accreditation or self declaration, including the name of the accreditation body; membership of a multilateral agreement/arrangement; scope of accreditation; names of peer reviewers.

Following the end of the transition period of the CIPM MRA, i.e., after **31 December 2003** (see Document JCRB-8/13(1)), CMCs submitted for publication on the BIPM MRA website will be required to have, as their basis, evidence of fulfilment of the criteria listed above under points 1-9, with special emphasis on the following points:

A. With respect to Criterion 1, it is the **on-going** responsibility of the Working Group on CMCs within each Consultative Committee to monitor the results of key and supplementary comparisons and provide a written report to the JCRB in the case that these results affect published CMCs. The relevant RMO representative to the JCRB transmits this report as appropriate within its RMO. It is the responsibility of the NMI providing the CMCs to notify the KCDB Coordinator in order to undertake appropriate action. Such action may involve increasing the uncertainties of CMCs or withdrawing CMCs. The relevant RMO will keep the JCRB informed of the status of such CMCs.
B. With respect to Criterion 8, after the end of the transition period, **CMCs published in the KCDB must be supported by a Quality System**. It is the responsibility of the NMI to report any such CMCs that are not supported by a Quality System to its RMO by the end of the transition period. The RMO representative to the JCRB then informs the JCRB Chairman. If CMCs do not fulfil this criterion after 31 December 2003, it is the responsibility of the RMO of which the NMI providing the CMCs is a member to provide a written request to the JCRB for an extension of time by which the NMI will put in place the supporting Quality System. If such an extension is not sought or granted, or if the revised deadline is not met, the CMCs will be withdrawn from the KCDB until such time as the Quality System criterion is fulfilled.
C. In cases where an NMI has used "provisional" evidence (i.e., not based on the results of key or supplementary comparisons) to support CMCs during the transition period, it is the responsibility of the NMI, through its RMO, to provide the JCRB with more substantive evidence (i.e., based on the results of key or supplementary comparisons) to support these CMCs as soon as it becomes available. It is the responsibility of each RMO to monitor these cases.

By **31 December 2003**, RMOs must inform the JCRB Chairman if they require additional evidence after the end of the transition period to support any CMCs of another RMO that have already been published. The JCRB Chairman will then notify the originating RMO of these requests. In these cases, the originating RMO must inform the JCRB Chairman by **1st July 2004** what action it proposes to take to address the issues raised.

[1] NMIs that have not yet taken part in key or supplementary comparisons are required as a minimum to have traceability of their national standards established through calibration by an NMI that has established its degree of equivalence through participation in the key comparison programs; they must also have participated in some bilateral comparisons in addition to meeting the other criteria listed here.

Alternatively, if an NMI wishes to withdraw previously published CMCs at the end of the transition period, the RMO-JCRB Representative must inform the JCRB Chairman by the end of the transition period.

All actions relating to published CMCs that are to be amended in any way following the end of the transition period should be tabled **at the 2nd meeting of the JCRB in 2004**.

Interpretation of Paragraph 11.3 of CIPM MRA concerning the end of the transition period

A. The MRA defines a transition period extending from the signature of the MRA in October 1999 until such time as the first round of key comparisons has been completed and the quality systems referred to in Paragraph 7.3 put in place.

B. In this text, the end of the transition period is not well defined since the carrying out of key comparisons is an on-going process and, taking all fields together, it will not be easy to say when the first round will be completed.

C. The MRA states that, during the transition period, CMCs in Appendix C and, therefore, on the database are considered provisional. Experience has shown that the great majority of CMCs now in Appendix C and on the database are not considered provisional and therefore any extension of the transition period will give the wrong impression to users. There should, therefore, be an agreed interpretation of the end of the transition period.

D. The JCRB considers that it would be reasonable to set, as the end of the transition period, the date of 31 December 2003. This will be three months after the end of the initial period of operation of the MRA, which ends at the time of the 22nd CGPM in October 2003.

E. Taking the transition period to end on this date, the situation will be the following:
1. A high proportion of the initial set of key comparisons will have been completed.
2. Most NMIs will have a quality system in place to meet the requirements of Paragraph 7.3 of the MRA.
3. CMCs will then be judged on the criteria given in the *JCRB Rules of Procedure for CMC entry into Appendix C*.

F. For any NMIs that do not completely comply with the criteria for Paragraph 7.3, corrective action will be agreed that will have to be implemented by a certain date to avoid their CMCs being deleted from Appendix C.

G. The JCRB will have to specify some criteria that will be used in the monitoring of the operation of quality systems under Paragraph 7.3. The JCRB should draw up such criteria as soon as possible.

H. Although the large majority of CMCs now on the database can reasonably be considered “non-provisional”, there may be some that will require review once the transition period is finished. RMOs should develop a procedure for such a review.

I. For the longer term the MRA will require not only that key comparisons are repeated at intervals, normally set by Consultative Committees, but that the quality systems referred to in Paragraph 7.3 will themselves be subject to periodic review.

J. The JCRB draws the attention of Consultative Committees and RMOs to the purposes of key comparisons as stated in the MRA, in particular the need to link the initiation of new key and supplementary comparisons to CMCs.

K. After the end of the transition period, new signatories to the MRA must meet the requirements of Paragraph 7.3 before their CMCs can be entered into Appendix C.

JCRB Guidelines for the monitoring and reporting of the operation of Quality Systems by RMOs

1. Introduction

A central component of the CIPM MRA requires that signatory NMIs establish and maintain a Quality System (QS). Unlike the CMC situation, however, the MRA does not explicitly specify how signatory NMIs review, gain confidence and accept each other's quality systems.

With regard to the establishment of a QS, the MRA provides for the following methods:

a) an NMI that chooses for its calibration and measurement services a quality system that meets the requirements of ISO Guide 25 or equivalent for an NMI, assessed by an accreditation body fulfilling the requirements of ISO Guide 58, declares its calibration measurement capabilities and submits them to the local RMO for review and transmission to the Joint Committee for analysis and inclusion in Appendix C.

b) an NMI that chooses to use a different way of assuring quality or chooses a different quality system, or ISO Guide 25 without third-party assessment, for its calibration and measurement services declares its calibration and measurement capabilities and submits them to the local RMO for review and transmission to the Joint Committee for analysis and inclusion in Appendix C.

Demonstration of competence and capability may require visits and examination of procedures by an NMI and/or by peers selected by the local RMO.

It is the role of the RMOs to review the QS operated by their member NMIs and to report on their acceptance or otherwise to the JCRB. The JCRB wishes to help build confidence between NMIs through assisting in the establishment of a transparent QS review process, which is mutually acceptable among all RMOs.

Note: 1. In the text following reference to an NMI includes NMIs that are signatories to the MRA, and any designated institutes.

2. In this document, QS means a quality system that meets the requirements of ISO/IEC 17025 or equivalent or a different way of assuring quality or a different quality system, as described in the MRA.

2. Guidelines

2.1 General Guidelines

The RMO must review the QS of each NMI.

- The NMI should submit a description of their QS to the RMO, for its calibration and measurement service. Minimum features to be included are:
  - Organogram of the NMI
  - Quality system management mechanisms
  - Detailed table of contents of the quality manual
  - List of administrative and technical procedures
  - Table of cross references between ISO/IEC17025 and the quality documentation of the NMI
  - List of calibration capabilities covered by the quality system
  - Customer complaints – process employed and statistics
  - Non conforming work – process employed & corrective actions
  - Report on internal audits

- Status of Management Reviews

- The QS operated by the NMI should be
  - accredited to ISO/IEC 17025 for calibration laboratories or equivalent for an NMI, or
  - self declared to ISO/IEC 17025 or a different quality system.

- The QS should cover all declared CMCs

- If considered necessary, the RMO may request that review visits by ' peers' be undertaken, in order that the NMI may demonstrate confidence and capability in their claimed CMCs. The NMI itself may request the review visits by peers. Where such visits take place, the RMO must ensure that the 'peers' have the necessary experience and are suitably qualified and independent.

- The RMO must have a process in place for the on-going monitoring of the QS of the NMIs. This process should aim to ensure that:
  - The accreditation or self declaration continues to be valid
  - The QS continues to cover the declared CMCs
  - Major extensions and modifications to QS (including changes to key staff) have been notified to the RMO

- The RMO must satisfy itself that, through its review process, the QS operated by the NMI has an effective and durable system in place for dealing with corrective actions, non-conforming work and complaints.

- The RMO should undertake a general review of the QS at a maximum interval of five years.

- In addition to the requirements of the QS, the review process may also take into account:
  - Knowledge of the NMIs capabilities through active participation in RMO projects and activities
  - Other available knowledge and experience, such as scientific publications, participation in scientific and training activities, visits and consultation with technical experts from other RMOs.

- The RMO should have an open process in place for the QS monitoring and review.

2.2 QS assessed by Accreditation Body

- The claimed CMC uncertainty must not be smaller than the uncertainties documented in the scope of accreditation
- The NMI must submit the name of the accreditation body and the names of the technical assessors and the lead assessor who were involved in the assessment of the NMIs capabilities.
- The accreditation body should operate according to ISO/IEC Guide 58 or 17011(draft) and should be a signatory to the ILAC MRA.

2.3 Self declared QS

- Where the QS is based on ISO/IEC 17025 the RMO must satisfy itself that the quality system complies with the standard.
- Where the QS is not based on ISO/IEC 17025 the following must be addressed:
  - Organisational and Management requirements including:
    - Quality manual
    - Document control process
    - Contract review
    - Complaints
    - Control of non conforming work
    - Corrective and preventative actions
    - Internal audits and management review
  - Technical requirements including:
    - Personnel

- Accommodation and environment conditions
- Calibration and measurement methods and method validation
- CRM certification process (where applicable)
- Equipment
- Calibration and measurement traceability and uncertainty
- Assuring the quality of results
- Reporting of results
- Sampling and handling of items (where applicable).

3. Report Guidelines

The RMO report on QS to the JCRB aims to provide information on the status of the QS for each NMI within a RMO (incl. coverage of CMCs), the standard to which the QS is being operated to by the NMI, and whether the QS is accredited or self declared

RMO reports should specify the following details on how each NMI assures quality:

- Whether the QS has been assessed by an accreditation body or is self declared
- Is the QS in accordance with a standard and if so specify the standard?
- Does the QS cover all CMC's in the approval process? If not, specify those CMC's not covered.
- Has the RMO reviewed the QS and, if so, what format did this take and when did it occur? Provide details of the reviewers, their findings and recommendations.
- If the QS is not yet fully implemented or its scope does not yet cover all CMCs in the approval process, specify proposed dates when implementation will be complete.
- If the QS has been assessed by an accreditation body, provide the following:
    - Name of the accreditation body
    - Is the accreditation body a signatory to the ILAC Mutual Recognition Arrangement?
    - Does the accreditation body fulfil the requirements of ISO Guide 58?
    - Names and affiliations of the technical assessors and the part(s) of the scope that they have assessed.
    - Copy of the scope of accreditation
- If the QS has not been assessed by an accreditation body or has not been reviewed by peers, the report should detail all evidence, which exists, that provides the RMO with full confidence in the claimed QS.

The report may contain other relevant information, which will help build inter-regional confidence (eg training courses/workshops on QS, exchange of information between NMIs on QS, interaction with other RMOs on QS)

Paul Hetherington for JCRB Ad-Hoc Working Group
4th March 2003

This certificate is consistent with the capabilities that are included in Appendix C of the MRA drawn up by the CIPM. Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (for details see http://www.bipm.org).

Note: In making a French version it became clear that in French it is necessary to be more explicit than in English. The following is the French text that has also been agreed with L. Erard on behalf of the BNM:

Ce certificat est en accord avec les aptitudes en matière de mesures et d'étalonnages (CMCs) figurant dans l'annexe C de l'arrangement de reconnaissance mutuelle (MRA) rédigé par le Comité international des poids et mesures (CIPM). D'après les termes du MRA, tous les laboratoires participants reconnaissent réciproquement la validité des certificats d'étalonnage et de mesurage pour les grandeurs, domaines et incertitudes de mesure mentionnés dans l'annexe C (pour plus de détails, voir (http://www.bipm.org).

The corresponding longer English version is the following:

This certificate is consistent with the calibration and measurement capabilities (CMCs) that are included in Appendix C of the Mutual Recognition Arrangement (MRA)drawn up by the International Committee for Weights and Measures (CIPM). Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (for details see http://www.bipm.org).

T.J.Quinn April 2002

DEFINITIONS OF TERMS USED IN THE CIPM MRA

Calibration and Measurement Capability (CMC)[1]

The term Calibration and Measurement Capability (CMC) as used in the CIPM MRA is defined as follows:
The CMC is the best measurement capability that is ordinarily available to customers under normal conditions,[2] *for example, as published in an NMI's service list and available, in principle, at any time. It should be:*

1. *performed according to a documented procedure and an established uncertainty budget under the quality system of the NMI;*
2. *performed on a regular basis; and*
3. *available to all clients.*

This is also stated in Paragraph T.7 of the CIPM MRA's Technical supplement:
"*... 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."*

Uncertainty Determinations for CMCs

INCLUDED ARE uncertainty contributions inherent in the best ordinarily available customer device during its calibration or measurement at the National Metrology Institute.

The actual characteristics of the device must also be considered for individual calibration certificates issued by the NMI.

EXCLUDED ARE uncertainty contributions (including transport uncertainties) associated with a customer's device before or after its calibration or measurement at the National Metrology Institute.

These contributions are not part of the calibration or measurement performed by the NMI and are therefore outside the NMI's control. It is the client's responsibility to take these extra factors into consideration.

[1] Based on "Report of JCRB *ad hoc* Working Group on CMC Uncertainties" (Document JCRB-8/9) and "APMP Proposals on Uncertainty Calculations for CMCs" (Document JCRB-8/9(3).
[2] Note: This does *not* include the NMI's capability to measure the very best instruments.

DOCUMENT JCRB-10/7_rev

A Note on Supplementary comparisons

T. J. Quinn December 2002

This Note is in response to questions that have arisen at recent meetings of Consultative Committees and Working Groups as to the status and formality of Supplementary comparisons in the CIPM MRA. This Note should be read in conjunction with the text of the MRA and *Guidelines for CIPM key comparisons* both of which are on the BIPM website:

(http://www.bipm.fr/enus/8_Key_Comparisons/mra.html)

Sections 1 to 4 present the situation with respect to the text of the MRA and *Guidelines for CIPM key comparisons* and in Section 5 some recommendations are made.

1. Supplementary comparisons in the main text of the MRA

Supplementary comparisons are not mentioned in paragraphs 1, 2, 3 or 4 of the main text of the MRA in which the structure of the MRA, the technical basis and the responsibilities of the Consultative Committees are laid out.

Supplementary comparisons first appear in paragraph 5 (d) where they appear as among the actions carried out by the RMOs in support of CMCs.

Participation in supplementary comparisons is laid out in paragraph 6.3 and again mentioned in 7.3.

According to paragraph 9.3, the coordination of supplementary comparisons along with other actions carried out by the RMOs comes under the JCRB. In the text of the main body of the MRA there are no further specifications concerning supplementary comparisons.

2. Supplementary comparisons in the technical supplement to the MRA

There is no mention of supplementary comparisons in sections T1 to T7 of the Technical supplement to the MRA.

Supplementary comparisons are first mentioned in T8 (e) where it is stated that the CCs have the responsibility to examine and confirm the results of RMO key and supplementary comparisons and incorporate them in Appendix B and the KCDB.

T10 states that supplementary comparisons may be carried out by CCs and RMOs and that they are to meet specific needs not covered by key comparisons, including comparisons to support confidence in CMCs.

3. Supplementary comparisons in the Appendices to the MRA

It is stated that Appendix B should contain the results of supplementary comparisons but it is left open as to how these are presented. They do not appear in Appendix D, the list of key comparisons

4. Supplementary comparisons in the *Guidelines for CIPM key comparisons*

Supplementary comparisons are mentioned in the *Guidelines for CIPM key comparisons* only at the very end, in Section 12, where it states that supplementary comparisons whose results are intended to be included in Appendix B must be carried out following these guidelines.

5. Comments

5.1. Role of supplementary comparisons

A reading of the full text of the MRA will show that supplementary comparisons do not have the same function nor the same formality as key comparisons. All of the effort that goes into establishing the degree of equivalence of national measurement standards is concentrated on key comparisons. Supplementary comparisons are "to meet specific needs not covered by key comparisons".

5.2. Inconsistency in T8

There is an inconsistency, however, in the text since in T8 (e) it requires the Consultative Committees to "*examine and confirm the results of RMO key and supplementary comparisons and incorporate them in Appendix B and the KCDB*." This is not consistent with the introductory text of T8 which refers only to key comparisons. Furthermore, nowhere in this paragraph does it mention Consultative Committee supplementary comparisons, which are permitted under Paragraph T10.

I propose that we resolve this inconsistency by:

(a) allowing RMO supplementary comparisons to be approved by RMOs with the additional step of passing them through the Consultative Committees being considered as a formality only and

(b) limiting the number of supplementary comparisons carried out by Consultative Committee so that they take place only to meet specific needs that cannot easily be covered by CIPM key comparisons; most supplementary comparisons will thus be RMO comparisons, which is in the spirit of the text of the MRA.

5.3. Publication of the results of supplementary comparisons

I propose that the results of supplementary comparisons appear in the KCDB and Appendix B normally only in the form of the text of the Final Report. Graphs and Tables of results will appear only if specifically requested (the final reports of supplementary comparisons can appear in the Metrologia Technical Supplement if requested).

5.4. Guidelines for carrying out supplementary comparisons

I proposed and it was accepted by the CIPM in October 2002, that the sentence in section 12 of the Guidelines for CIPM key comparisons be modified to read:

"Supplementary comparisons should be carried out following protocols inspired by these Guidelines

Consultative Committee Working Groups on CMCs

Terms of Reference:

To facilitate the Inter-regional CMC Review Process, it is recommended that each Consultative Committee form a Working Group on CMCs. The objective of the WG will be:

a) To establish and maintain lists of service categories, and where necessary rules for the preparation of CMC entries;

b) To agree on detailed technical review criteria;

c) To coordinate and where possible conduct inter-regional reviews of CMCs submitted by RMOs for posting in Appendix C of MRA;

d) To provide guidance on the range of CMCs supported by particular Key Comparisons;

e) To identify areas where additional Key Comparisons are needed;

f) To coordinate the review of existing CMCs in the context of new results of key and supplementary comparisons.

This WG should include representation from all RMOs that have NMIs active in the relevant technical area. WG membership is expected to come from the relevant RMO committees involved in CMC reviews; appropriate experts being chosen depending upon the particular field under review.

To: NMI Directors of States not yet Members of the Metre Convention or Associates of the CGPM ***(updated August 2003)***

Subject: The growing importance of metrology and the benefits of participation in the Metre Convention, notably the CIPM MRA

Dear Colleagues,

The growing importance of metrology:
The impetus of facilitating world trade and the associated need to eliminate technical barriers to trade is leading to a greater awareness worldwide of the role of traceable measurement. It underpins activities in all areas of science and technology and has a particularly close and essential relationship with written (specification) standards, product quality and accreditation. It is now recognized that metrology provides a fundamental basis not only for the physical sciences and engineering, but also for chemistry, the biological sciences and related areas such as the environment, medicine, agriculture and food. Various high-level studies demonstrate the impact of measurement to society; most recently, the report "*Evolving Needs for Metrology in Trade, Industry and Society and the role of the BIPM"*[1] highlights current drivers and strategies to address the worldwide need for reliable measurement (see also references therein).

I am writing to you, a Director of a National Metrology Institute (NMI) of a country not yet a Member State of the Metre Convention or Associate State of the General Conference on Weights and Measures (CGPM), to draw to your attention the importance of participation in the activities carried out under the Metre Convention[2] as a means of assuring national measurement capability in a global environment. In particular, I refer to the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures (CIPM).

The CIPM MRA:
It is now almost four years since October 1999 when the CIPM MRA between NMIs was formally established. This MRA[3] provides for international mutual recognition of national measurement standards and calibration and measurement certificates issued by signatory NMIs. Signature of the CIPM MRA is open only to Directors of the NMIs of Member States of the Metre Convention or Associate States or Economies of the CGPM. In August 2003, I can report that signatories to the CIPM MRA comprise the Directors of NMIs of forty-three Member States of the Metre Convention, two International Organizations, and ten States or Economies that have become Associates of the CGPM.[4] Only a small number of these participants are from small and developing countries.

Objectives of the CIPM MRA:
The objectives of the CIPM MRA are to provide governments and other parties with a secure technical foundation for wider agreements related to international trade, commerce and regulatory affairs. Thus it is intended to help eliminate technical barriers to trade (TBTs) for governments entering into international agreements involving trade of products and services.[5] An economic analysis of the benefits of the MRA,[6] commissioned by the International Bureau of Weights and Measures (BIPM) and undertaken by KPMG Consulting, found that a conservative estimate of the impact of the CIPM MRA in reducing TBTs is likely to be very large; a sum of at least US$4 billion was mentioned. The significance that Signatories attach to

[1] This document is published by the BIPM and available on the BIPM website (www.bipm.org).
[2] For information on the history, structure and activities carried out under the Metre Convention, see the BIPM website (http://www.bipm.org/enus/1_Convention/foreword.html).
[3] The CIPM MRA complements the MRA of the International Laboratory Accreditation Cooperation (ILAC), by providing the basis for international recognition of national measurement standards that are themselves the basis of traceability to the International System of Units (SI).
[4] See Table 1.
[5] The mechanisms by which this is achieved are outlined in the Appendix attached to this letter.
[6] See www.bipm.org/pdf/KPMG_report.pdf.

their participation can be appreciated by noting that around 89 % of world trade in merchandise exports is between MRA participant nations.[7] As a tool in the reduction of TBTs, the CIPM MRA is already being referenced in intergovernmental trade agreements. The Joint US-EC Declaration on Cooperation in Metrology in Support of Trade sets out the steps required to reduce unnecessary duplicative measurements, including recognition of the measurement capabilities of NMIs that are signatories to the CIPM MRA and the establishment of the equivalence of national measurement standards based on the CIPM MRA. This Declaration is likely to be extended to cover trade between the EC and other countries.

Participation in the CIPM MRA:

Participation in the CIPM MRA is a critical asset for all countries, large or small, seeking to demonstrate their technological capabilities in the international trade arena, particularly with its increasing applicability in underpinning measurements in areas such as the environment, agriculture and medicine.[8] There is no doubt that more and more regulatory, governmental and intergovernmental bodies will look to the CIPM MRA as a source of technical support for trade, regulation and the demonstration of compliance with a range of formal requirements. These and other users will look for relevant data in the BIPM Key Comparison Database (KCDB)[9] in respect of a given country and this will very likely become the only internationally accepted reference for the acceptability of calibration and measurement certificates. Participation is, therefore, increasingly necessary if countries want to support international policies on the reduction of TBTs and if they need to demonstrate their metrological competence and credibility to this growing number of formal and official users. Participation also provides countries with a voice in international discussions and ensures they are kept abreast of relevant international trends, benefits that translate to support for and facilitation of technology transfer within the domestic environment.

The creation of the category of "Associate" States/Economies of the CGPM at the time of the MRA's establishment, with a much lower annual payment than that for Signatories to the Metre Convention, was specifically intended to assist this participation in the MRA by smaller States or developing countries through their Regional Metrology Organizations (RMOs). (In 2003, for example, the minimum annual subscription to be an Associate of the CGPM is approximately US$4,700.[10]) In this respect, one of the outcomes from a proposed new joint collaboration involving the BIPM and bringing together all specialist organisations that operate at a global level and that are active in promoting MAS (metrology, accreditation and standardization) as a tool for sustainable economic development, is to provide an international framework to help developing countries prepare for participation in, and thereby access the benefits from, international arrangements such as the CIPM MRA. The intention of this joint collaboration , among other things, is to help meet the requirements for effective implementation of agreements negotiated by the World Trade Organization (WTO).

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[7] Based on figures from the *World Trade Organization 2001 International Trade Statistics*.

[8] Chemistry is now a key area of activity in world metrology, coordinated by the CIPM's Consultative Committee on Amount of Substance, metrology in chemistry (CCQM). The CCQM has been active in organizing international comparisons (notably key comparisons and pilot studies) of measurement capabilities related to chemical and biological quantities that have a high impact on quality of life (e.g., contaminants in food [such as pesticide residues and arsenic] and measurements related to health [including cholesterol and glucose] and the environment [e.g., atmospheric pollutants]). As a consequence, the benefits of the CIPM MRA and BIPM key comparison database (KCDB) are extending to the areas of environment, food, agriculture, medical and biotechnology measurements. Stronger links are being developed between the BIPM/CIPM and bodies such as the World Meteorological Organization (WMO), the World Health Organization (WHO) and the International Federation for Clinical Chemistry and Laboratory Medicine (IFCC). A Joint Committee on Traceability in Laboratory Medicine, the JCTLM, has now been established with the principal promoters being the BIPM, the IFCC, and the ILAC. Committee members include regulatory bodies (such as the US Federal Drug Administration, the FDA) the Enterprise Directorate-General of the European Commission, and industry associations.

[9] The KCDB provides the technical data on which mutual recognition through the CIPM MRA is based.

[10] "The annual subscription of each Associate State or Economy will be determined from its UN contribution, as for Member States but with a minimum equal to 0.05 % of the annual dotation of the BIPM" (Source: *Resolution 3, 21st CGPM, October 1999*.) Individual subscription levels are available on application from the BIPM.

Benefits of participation in the CIPM MRA:
A recognized metrological competence is increasingly important not only in export matters but also in the verification that imported goods meet national and international standards and regulations. For developing nations the latter can have a significant impact on the quality of life of a population that often is critically dependent on imports of pharmaceutical as well as consumer and other manufactured products. Benefits of participation in the CIPM MRA identified by NMI Directors interviewed for the KPMG study include the networking, access and recognition it promotes between the NMIs of developing and developed countries.

With metrology underpinning all aspects of science and technology, the CIPM MRA plays a critical role in laying a sound foundation for recognition of each nation's technical infrastructure. In addition to metrology, this encompasses its legal system of measurement, its laboratory accreditation and conformity assessment schemes, as well as its documentary standards activities. The data provided in the MRA's KCDB form the most comprehensive, internationally recognized and credible information resource of the technical competence of participating nations to undertake accurate measurements at a level appropriate to their technological requirements.

An NMI's participation in the CIPM MRA enables national accreditation bodies and others to be assured of the international credibility and acceptance of the measurements the NMI disseminates. It also provides international recognition of the measurements made by accredited testing and calibration laboratories provided that these laboratories can demonstrate competent traceability of their measurements to a participating NMI. Taking advantage of this relationship, the ILAC and the CIPM signed a Memorandum of Understanding in November 2001 to ensure a sound, linked, technical framework to underpin cross-border trade arrangements and work towards the ideal of having products that are "tested once and accepted everywhere". Industrial, scientific and technological communities within participating countries can access this framework to assure the credibility in measurement capability they require to participate effectively in the global marketplace.

How your country can participate:
I strongly urge you to present this letter to your governmental representatives in support of your NMI's participation in the CIPM MRA. The benefits are clear, as is the urgent need for your participation in order to achieve international recognition of your NMI's metrological capabilities through this means.

The formal procedure to become an Associate[11] is simple and straightforward: a letter[12] is sent to me, the Director of the BIPM, by a representative of the appropriate government or other official body (normally that responsible for metrological affairs in your country), expressing the wish of the State to be added to the list of Associates. At the same time the first annual contribution is sent to the BIPM. The amount and means of payment I can tell you at the moment of application.

Please do not hesitate to contact me if you need any further information.

Yours sincerely,

Terry Quinn
Director, BIPM.

August 2003.

[11] Note that NMIs of Associates to the CGPM are entitled to participate in the CIPM MRA through their RMO. However, participation in CIPM Consultative Committees and associated activities is restricted to NMIs of Member States of the Metre Convention.
[12] A draft form letter is provided as an attachment to this document.

Draft Form Letter of Application to become an Associate State of the CGPM, from appropriate Governmental or other Official Authority in [Name Of Country] to the Director of the BIPM

To: Dr T Quinn
Director, Bureau International des Poids et Mesures (BIPM)
Pavillon de Breteuil, F-92312 Sèvres Cedex
FRANCE.

Dear Sir,

I am writing to inform you that [NAME OF COUNTRY] wishes to become an Associate State of the General Conference on Weights and Measures (CGPM), under the terms of Resolution 3 of the 21st CGPM.

The organisation in my country that will represent [NAME OF COUNTRY] in all related matters is the [NAME OF NATIONAL METROLOGY INSTITUTE OR OTHER PEAK NATIONAL INSTITUTE RESPONSIBLE FOR METROLOGY].

The first annual subscription is being sent to the BIPM at the same time as this letter.

I understand that on [NAME OF COUNTRY] becoming an Associate State of the CGPM, the Director of this Institute will be entitled to sign the Mutual Recognition Arrangement (MRA) of the International Committee for Weights and Measures (CIPM).

Yours, etc.

APPENDIX

The objectives of the CIPM MRA are: to establish the degree of equivalence of national measurement standards maintained by NMIs; to provide for the mutual recognition of calibration and measurement certificates issued by NMIs; and thereby to provide governments and other parties with a secure technical foundation for wider agreements related to international trade, commerce and regulatory affairs.

Participants recognize each other's capabilities based on the following criteria:

1. Credible participation in comparisons identified by the international measurement community as of *key* significance for particular quantities over specified ranges. Presently around 400 "**key comparisons**" have been designated and are being carried out by NMIs, of which about 130 have been completed.
2. Credible participation in other comparisons related to specific calibration services or that have some trade and/or economic priority for individual countries or geographic regions: so-called "**supplementary comparisons**". At this time, some fifty supplementary comparisons are being undertaken.
3. Having in place for calibration services a **quality system** that is recognized as being international best practice, in turn based on agreed criteria.

The first of these elements provides the technical basis for recognition under Part 1 of the MRA. Compliance with both criteria 2 and 3 enables recognition under Part 2 of the MRA. The BIPM key comparison database (KCDB: www.bipm.org/kcdb) contains the results of key and supplementary comparisons (Appendix B), together with lists of peer-reviewed and approved calibration and measurement capabilities (CMCs) of NMIs (Appendix C).[13] At present, there are approximately 14,000 individual CMCs published in the KCDB, all of which have undergone a process of peer evaluation by NMI experts within the Regional Metrology Organizations, coordinated internationally by the "Joint Committee of the Regional Metrology Organizations and the BIPM" (the JCRB).

[13] Appendix A lists the MRA signatories, and Appendix D lists all key and supplementary comparisons.

TABLE 1

A. The Directors of the NMIs of the following 43 Member States of the Metre Convention have signed the CIPM MRA

Argentina[A]	Greece[C]	Russian Federation[EGH]
Australia[F]	Hungary[C]	Singapore[F]
Austria[C]	India[F]	Slovakia[CH]
Belgium[C]	Ireland[C]	South Africa[EGI]
Brazil[A]	Italy[C]	Spain[C]
Bulgaria[DH]	Japan[F]	Sweden[C]
Canada[AG]	Republic of Korea[F]	Switzerland[C]
Chile[A]	Malaysia[F]	Thailand[F]
China[F]	Mexico[A]	Turkey[C]
Czech Republic[C]	The Netherlands[C]	United Kingdom[C]
Denmark[C]	New Zealand[F]	United States[A]
Egypt[GJ]	Norway[C]	Uruguay[A]
Finland[C]	Poland[C]	Yugoslavia[D]
France[C]	Portugal[C]	
Germany[BCH]	Romania[DH]	

A: Member of SIM; B: Associate Participant of SIM
C: Member of EUROMET; D: Corresponding Applicant of EUROMET
E: Corresponding NMI of EUROMET
F: Member of APMP; G: Associate Member of APMP
H: Member of COOMET
I: Member of SADCMET; J: Associate Member of SADCMET

B. International Organizations that are Signatories to the CIPM MRA

International Atomic Energy Agency (IAEA)
Institute for Reference Materials and Measurements (IRMM), European Commission Directorate General, Joint Research Centre (JRC)[C]

C. The 9 Signatories to the CIPM MRA from Associates of the CGPM

Chinese Taipei[F]
Cuba[H]
Ecuador[A]
Hong Kong, China[F]
Kenya[J]
Latvia[D]
Lithuania[DH]
Malta[D]
Philippines[F]
Slovenia[C]

Note: Three other Associates of the CGPM - Belarus[H], Panama[A] and the Ukraine[DH], have not yet signed onto the CIPM MRA.