Bureau International des Poids et Mesures

Consultative Committee for Ionizing Radiation (CCRI)

Report of the 23rd meeting
(15 May 2012)
to the International Committee for Weights and Measures

Comité international des poids et mesures

Note:

Following a decision made by the International Committee for Weights and Measures at its 92nd meeting (October 2003), reports of meetings of Consultative Committees are now published only on the BIPM website and in the form presented here.

Full bilingual printed versions in French and English are no longer published.

M. Milton,
Director BIPM

LIST OF MEMBERS OF THE CONSULTATIVE COMMITTEE FOR IONIZING RADIATION

as of 15 May 2012

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K. Carneiro, Member of the International Committee for Weights and Measures

Executive Secretary

P.J. Allisy-Roberts, International Bureau of Weights and Measures [BIPM]

Members

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The Chairman of Section II.

The Chairman of Section III.

The Director of the International Bureau of Weights and Measures [BIPM], Sèvres.

Section I: x- and γ-rays, charged particles

Chairman

P. Sharpe, National Physical Laboratory [NPL], Teddington.

Members

Australian Radiation Protection and Nuclear Safety Agency [ARPANSA], Yallambie.

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Central Office of Measures/Glówny Urzad Miar [GUM], Warsaw.

Commissariat à l'Énergie Atomique/Laboratoire National Henri Becquerel [LNE-LNHB], Gif-sur-Yvette.

D.I. Mendeleyev Institute for Metrology, Rostekhregulirovaniye of Russia [VNIIM], St Petersburg.

Ente per le Nuove Technologie, l'Energia e l'Ambiente, Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti [ENEA-INMRI], Rome.

Federal Office of Metrology/Office Fédéral de Métrologie [METAS], Bern-Wabern.

Hungarian Trade Licensing Office [MKEH], Budapest.

International Atomic Energy Agency [IAEA], Vienna.

International Commission on Radiation Units and Measurements [ICRU].

Korea Research Institute of Standards and Science [KRISS], Daejeon.

National Institute of Metrology [NIM], Beijing.

National Institute of Standards and Technology [NIST], Gaithersburg.

National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology [NMIJ/AIST], Tsukuba.

National Physical Laboratory [NPL], Teddington.

National Research Council of Canada - Institute for National Measurement Standards [NRC-INMS], Ottawa, Ontario.

Physikalisch-Technische Bundesanstalt [PTB], Braunschweig.

VSL [VSL], Delft.

The Director of the International Bureau of Weights and Measures [BIPM].

Observers

Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas [CIEMAT], Madrid.

Comisión Nacional de Energía Atómica [CNEA], Buenos Aires.

Czech Metrology Institute/Český Metrologický Institut [CMI], Brno.

Instituto Tecnológico e Nuclear [ITN], Sacavém.

International Organization for Medical Physics [IOMP].

International Radioprotection Association [IRPA].

National Laboratory for Metrology of Ionizing Radiation, Institute of Radiation Protection and Dosimetry CNEN/Laboratório Nacional de Metrologia das Radiações Ionizantes, Instituto de Radioproteçao e Dosimetria [LNMRI-IRD], Rio de Janeiro.

National Metrology Institute of South Africa [NMISA], Pretoria.

National Radiation Protection Agency [NRPA], Oslo.

Section II: measurement of radionuclides

Chairman

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Members

Australian Nuclear Science and Technology Organisation [ANSTO], Menai.

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"Horia Hulubei" National Institute of Physics and Nuclear Engineering [IFIN-HH], Buchares t- Magurele.

Hungarian Trade Licensing Office [MKEH], Budapest.

Institut de Radiophysique Appliquée [IRA], Lausanne.

Institute for Reference Materials and Measurements [IRMM], Geel.

Korea Research Institute of Standards and Science [KRISS], Daejeon.

National Institute of Metrology [NIM], Beijing.

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National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology [NMIJ/AIST], Tsukuba.

National Metrology Institute of South Africa [NMISA], Cape Town.

National Physical Laboratory [NPL], Teddington.

Physikalisch-Technische Bundesanstalt [PTB], Braunschweig.

Radioisotope Centre Polatom [RC], Swierk.

The Director of the International Bureau of Weights and Measures [BIPM], Sèvres.

Observers

Bhabha Atomic Research Centre [BARC], Mumbai. Bundesamt für Eich- und Vermessungswesen [BEV], Vienna.

Comisión Nacional de Energía Atómica [CNEA], Buenos Aires.

International Atomic Energy Agency [IAEA].

International Commission on Radiation Units and Measurements [ICRU]. International Organization for Medical Physics [IOMP].

International Radioprotection Association [IRPA].

National Research Council of Canada - Institute for National Measurement Standards [NRC- INMS], Ottawa, Ontario.

VSL [VSL], Delft.

Section III: neutron measurements

Chairman

D. Thomas, National Physical Laboratory, Teddington.

Members

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Czech Metrology Institute/Český Metrologický Institut [CMI], Brno.

D.I. Mendeleyev Institute for Metrology, Rostekhregulirovaniye of Russia [VNIIM], St Petersburg.

Institute for Reference Materials and Measurements [IRMM], Geel.

Korean Research Institute of Standards and Science [KRISS], Daejon.

National Institute of Metrology [NIM], Beijing.

National Institute of Standards and Technology [NIST], Gaithersburg.

National Laboratory for Metrology of Ionizing Radiation, Institute of Radiation Protection and Dosimetry CNEN/Laboratório Nacional de Metrologia das Radiações Ionizantes, Instituto de Radioproteçao e Dosimetria [LNMRI-IRD], Rio de Janeiro.

National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology [NMIJ/AIST], Tsukuba.

National Physical Laboratory [NPL], Teddington.

Physikalisch-Technische Bundesanstalt [PTB], Braunschweig.

The Director of the International Bureau of Weights and Measures [BIPM], Sèvres.

Observers

Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas [CIEMAT], Madrid.

Chinese Institute of Atomic Energy [CIAE], Beijing.

International Atomic Energy Agency [IAEA].

International Commission on Radiation Units and Measurements [ICRU].

1–4 WELCOME / INTRODUCTION / RAPPORTEUR / REPORT OF PREVIOUS MEETING

The 23rd meeting of the Consultative Committee for Ionizing Radiation (CCRI) was held at the BIPM headquarters in Sèvres on 15 May 2012.

Present: Dr K. Carneiro (President), Prof. Dr M. Kühne (BIPM Director) Dr P. Allisy-Roberts (Executive Secretary).

Delegates: Dr P. Sharpe, Dr L. Karam (SIM), Dr D. Thomas, Dr H. Bjerke (EURAMET), Ms Z. Msimang (AFRIMETS), Dr S. Sepman (COOMET), Mr J. Wu (APMP).

Guests: Prof. J. Chavaudra (IOMP), Prof. B. Michael (ICRU), Dr A. Meghzifene (IAEA), Dr A. Aalbers, Dr G. Hassan, Mr J.-M. Los Arcos, Dr J. Alverez Romero.

BIPM: Mr O. Altan (JCRB), Dr D. Burns (rapporteur), Mr S. Courte, Mr A. Henson, Dr C. Michotte, Mr M. Nonis, Dr S. Picard, Dr G. Ratel, Dr C. Thomas.

Apologies: Dr K. Kase (IRPA), Dr A. Velazquez Berumen (WHO), Ms C. Kessler (BIPM), Mr P. Roger (BIPM).

The numbering below follows that of the agenda.

The BIPM Director, M. Kühne, welcomed the participants. The President, K. Carneiro, formally opened the meeting and outlined the agenda. He welcomed the presence of representatives from the regional metrology organizations and stakeholders from international organizations. D. Burns was appointed *rapporteur*. There were no comments on the report of the 22nd meeting of the CCRI in 2011.

5 REPORT FROM THE PRESIDENT

5.1 President's report to the CGPM and 5.4 Present Strategic Plan

K. Carneiro presented his talk given to the CGPM in October 2011 entitled "*8 Highlights of the CCRI*". These highlights were: (i) the success of the accelerator dosimetry comparisons using the BIPM calorimetric absorbed-dose standard; (ii) progress on ICAD, the International Collaboration on Accelerator Dosimetry; (iii) the SIR and its extension to short-lived radionuclides; (iv) developments in dosimetry for mammography and brachytherapy at the BIPM; (v) the key comparison K11 of neutron fluence currently running; (vi) challenges in conducting comparisons and in metrology in general, notably with budget reductions and loss of experience, concluding that metrology requires maintenance and constant attention; (vii) the three special issues of *Metrologia* on the occasion of the 50th anniversary of the CCRI; (viii) the implementation of a Strategic Plan for the CCRI. He went on to summarize the present Strategic Plan through the 8 sections listed in the table of contents;

introduction and scope, mission and tasks, stakeholders, vision 2020, actions, description of stakeholders, description of actions, CCRI working groups.

5.2 Report from the CGPM

M. Kühne summarized the outcome of the CGPM of October 2011, notably in relation to the project for an accelerator and vault at the BIPM at a total cost of 3.7 M€. While the CGPM did not agree to fund this project, the need for the facility was recognized and the plan was now to include a proposal based on external funding for the accelerator and vault in the work programme for 2016–2019. It had become increasingly evident that those NMIs without an accelerator were generally in support of an accelerator at the BIPM, while those who were against tended to be the larger NMIs that already had their own accelerator. It was important for the CCRI to keep up the pressure on governments. In the short term the CGPM asked for a revised BIPM programme based on a reduced budget over the period 2013–2015.

5.3 Report from the CGPM *ad hoc* Group

The CGPM set up an a*d hoc* Group to review the role and governance of the BIPM; this group had already met and produced a report with 20 recommendations. In working document CCRI/12-12, K. Carneiro commented on four of these recommendations relevant to the work of the CCs. Three of these, regarding strategic planning, RMO involvement in the planning process and the format of the President's report to the CGPM, were in effect already implemented in the CCRI. The fourth recommendation, that the CC Presidents should not be drawn from the CIPM, raised the problem of how otherwise to communicate CC issues to the CIPM effectively.

5.5 CC Workshop on future strategic planning

The president invited A. Henson to talk briefly on CCRI/12-03, the CC Working Group Strategy Document for Rolling Programme Development. A. Henson explained that a common strategic approach would improve planning and transparency and provide a means by which progress could be tested. The result should be a greater sense of 'ownership' by the NMIs and a clearer evaluation as to what they are committing themselves.

K. Carneiro's comments on this document are summarized in CCRI/12-11. The present CCRI Strategic Plan meets the general requirements but not the format, which would be changed at a later date. Two areas of the Strategic Plan require further detail; the programme of future key comparisons and the resource implications for laboratories piloting comparisons. He outlined the proposed revision cycle for strategic plans (Section 10 of CCRI/12-03) and how this revision would be implemented in the CCRI. The first step was the incorporation of a one-year report for 2011 into the present 2009-2019 Strategic Plan as added paragraphs at appropriate points (this is document CCRI/12-10; for working groups, the report for 2011 is added to the bottom of each table and supplementary information for the 2011 report is included in a new Section 10). The plan would then be "rolled" to create a Strategic Plan for 2013–2023, with 'short-term' indicating 2013–2015, 'medium-term' 2016-2019 and 'long-term' 2020–2023 (and subsequently 'rolled' in phase with the CGPM cycle). A 'four-year' report for the 2009–2019 Strategic Plan (covering 2009–2012) would be prepared during

2013 and in 2014 the first one-year report for the 2013–2023 plan would be due (covering 2013), followed by a two-year report in 2015.

Regarding the report for 2011 (CCRI/12-10), L. Karam expressed concern over the added column for EURAMET in the 'short-term actions' table in Section 5.1, stating that she had already included the RMO contributions in her report for Section II. P. Sharpe made the suggestion that the RMO roadmaps could be referenced.

6 REPORT ON THE WORK OF THE CCRI

6.1 CCRI RMO Working Group

A. Aalbers reported on the CCRI RMO Working Group meeting held the previous day. His summary was divided into four topics; the status of CMC submissions, the status of published CMCs in the KCDB, outstanding problems regarding CMCs and the review of the "International Rules and Service Categories". A significant issue was the time taken for inter-RMO review, with the average review taking 23 weeks. H. Bjerke had proposed solutions to improve the intra-RMO review process and thereby make the inter-RMO review more efficient. One problem was the size of the submitted files; by grouping a large number of CMCs, a single problematic CMC would delay the entire set. Review would be more efficient if CMCs were submitted in smaller groupings, for example for individual NMIs. A. Henson noted the 'coordinated' approach used, for example, in the CCEM, where the number of RMOs reviewing a given submission was reduced, the RMOs having faith in each other's review process. These proposals to lighten the load of the CMC review process and shorten the time taken would be discussed at a JCRB workshop on CMC reviewing planned for March 2013.

The RMO Working Group had also approved the CCRI document on the validity criteria for comparisons, with one change being suggested regarding the definition of the starting date for validity as being the end of the measurements by that participating laboratory, as recorded in the KCDB. This document, CCRI/12-05, modified as noted, was submitted for approval by the CCRI (see Section 9).

6.2 CCRI Section I and its Working Groups

P. Sharpe presented a progress report for Section I (CCRI/12-07) based on the short-term actions table of the Strategic Plan. Comparison reports are now given a higher priority at the BIPM and in the NMIs and the CCRI(I) approval process is now reduced to as little as two weeks in some cases. Accelerator dosimetry comparisons using the BIPM travelling calorimeter standard have been a success, with fournow completed (with the NRC, PTB, NIST and the LNE-LNHB) despite delays due to technical difficulties. Mammography comparisons are now established at the BIPM and the CCRI(I) has formally approved the uncertainty budget; results of comparisons with the NMIJ, PTB, NIST and the NRC are available in the KCDB. Brachytherapy comparisons were heavily dependent on guest workers at the BIPM and after a slow start had made good progress with four comparisons completed (with the VSL, NPL, LNE-LNHB and the PTB). P. Sharpe added that NMI developments in absorbed-dose standards for brachytherapy would create a medium-term need for comparisons.

Action to improve the dialogue between NMIs and DIs has been taken on a number of fronts, including the technical committees of the RMOs and the IAEA/WHO SSDL network; the EMRP research programme is a good example of increased coordination. A method of ensuring links between the IAEA/WHO SSDLs and the KCDB has been agreed. Members of the SSDL network who are also DIs can have the results of bilateral comparisons with the IAEA included in the KCDB, provided this is notified to the appropriate RMO in advance. Results not eligible for inclusion in the KCDB may be published in the IAEA/WHO SSDL Newsletter.

Regarding diagnostic imaging, a number of NMIs are establishing the measurement needs and developing appropriate methods and standards, for example the PTB (dosimetry for CT) and the NIST (dosimetry for CT and digital mammography). The CCRI(I) has stated that additional key comparisons should not be required. The ICRU Key Data Report Committee is expected to publish its report on recommended values for key physical constants during 2012 or early 2013. The implications for air kerma and absorbed-dose standards will be discussed at the CCRI(I) meeting in 2013.

Regarding medium-term actions, these remain broadly applicable; accelerator in-beam dosimetry, brachytherapy absorbed-dose standards, small-field dosimetry and absorbed-dose standards for proton and carbon ion dosimetry are emerging as priority areas. Work towards new biologically-based quantities is also a development area for the long term. It was noted that the detailed planning for a number of actions is dependent on BIPM access to an accelerator.

A. Aalbers stated that the CCRI should be addressing the needs of non-conventional fields ("true-beam" and tomotherapy), a proposal strongly supported by J. Chavaudra (IOMP).

K. Carneiro made the general remark that vague action points, such as "increased dialogue between NMIs and DIs", should evolve into more specific objectives. He also commented that although the ADWG had completed its remit, it would not be terminated at present as it might have a revised role.

6.3 CCRI Section II and its Working Groups

Four (of the five) working groups of the CCRI(II) had met in the week preceding the CCRI meeting. L. Karam reported on progress in radionuclide comparisons (CCRI/12-06); three key comparisons, for ^{241}Pu, ^{177}Lu and tritium, had reports in Draft B form, while a fourth, for ^{85}Kr, was in Draft A form. Similarly, four supplementary comparisons (shellfish, ^{131}I, ^{57}Co and uncertainties in $4\pi\beta-\gamma$ coincidence) were in Draft B form and a fifth (bilberry) in Draft A form. An update of the ten-year plan for radionuclide comparisons was presented.

Completed actions included a more rapid turnaround for comparison reports, due in part to the removal of pairwise degrees of equivalence, and the establishment of the SIR travelling instrument (SIRTI) for measurements of ^{99m}Tc, which has now been used for measurements at the NPL (test), NIST, NMIJ, KRISS and the NIM; the system will now be extended to measure ^{18}F. Also nearing completion was the harmonization of the evaluation of uncertainties and the development of a more robust method for calculating a key comparison reference value (KCRV), based on a modified Mandel-Paule method. Work has started on a special issue of *Metrologia* on the evaluation of uncertainties and publication is expected during 2013.

Report CCRI/12-06 contains a table summarizing the changes to be made for the next rolling programme, with three short-term actions being carried forward to 2013–2015 (increased dialogue between NMIs and DIs, dosimetry for diagnostic imaging and recommended values for physical constants) and two medium-term actions becoming short-term (instrument for maintaining the

becquerel and the extension of the SIR to pure α and pure β emitters).

J. Alvarez raised the issue of standards for ^{41}Ar for nuclear plants. H. Bjerke saw a medium-term need for work on radon, although L. Karam replied that activity measurements for radon were under control and that the health risk from radiation exposure was not a task for CCRI(II). A. Meghzifene (IAEA) raised the problem of traceability for radionuclide calibrators and the reliance on manufacturers. L. Karam replied that, while for example the NIST works with manufacturers, this issue was not yet addressed in the CCRI strategy and K. Carneiro suggested that this might indeed be a subject for inclusion in a future Strategy Plan.

P. Allisy pointed out that the ongoing BIPM bilateral comparisons, which are central to the work programme, were not very visible in the Strategic Plan and are entered only as a short sentence in "Long-term actions" (on page 8 of the plan). K. Carneiro agreed that these comparisons should be more evident and described strategically, with their continued need being reviewed regularly.

6.4 CCRI Section III

D. Thomas reported on progress and current issues in neutron metrology (CCRI/12-09). Delays in completing neutron comparisons, a longstanding problem, are largely circumvented by conducting measurements at a single facility when possible, such as in the present comparison for measurements of monoenergetic neutron fluence. However, this does not test an NMI's ability to produce a suitable neutron fluence. Regarding personal dose equivalent, although some NMIs have expressed an interest, none has agreed to organize a comparison of neutron personal dosimeters. Particular problems relate to the definition of the quantity in terms of a parallel beam, which cannot be realized in practice, and the ISO measurement approach addressing the problem of the dosimeter's response to scatter.

Activities presently underway related to neutron cross-section data include: NIST-IRMM measurements of the neutron thermal capture cross sections for ^{6}Li and ^{10}B; measurements at PTB of the Maxwell-Boltzmann simulated spectrum at 25 keV for use in measuring Maxwellian-averaged cross sections (MACS); an EMRP project involving IRMM, NPL and PTB to measure the ^{197}Au(n,γ) cross section around 100 keV and the ^{240,242}Pu(n,f) cross section in the fast neutron energy range. The special issue of *Metrologia* on neutron metrology was published in December 2011, a major achievement for the CCRI(III).

Regarding dialogue between NMIs and DIs, all those laboratories with neutron facilities such as the IRMM and IRSN Cadarache are already active members of CCRI(III). Italy, however, are active in neutron calibrations but as yet did not participate in Section(III). Neutron fluence standards for fusion do not currently meet the requirement for very intense, pulsed fields, and a 2009 EMRP proposal in this area was unsuccessful. More recently, the International Thermonuclear Experimental Reactor (ITER) team has started discussions with several NMIs.

D. Thomas also commented on the lack of active CCRI(III) Working Groups and the absence of an international conference dedicated to neutron metrology, making the meetings of the CCRI(III) the main forum for scientific exchange.

6.5 BIPM Work Programme in Ionizing Radiation 2009–2012

P. Allisy summarized the comparisons that have been made over the past 18 months and presented a table of future needs for comparisons, based on a ten-year cycle. These ongoing BIPM comparisons are a critical part of the work programme and, while included in the strategy, their importance should perhaps be made more evident when the Strategic Plan is updated. The plan should also include the basis on which future comparisons are justified. The number of comparisons and characterizations of national standards had already surpassed the target set in 2009. Two additional dosimetry comparisons were made at the request of the LNE-LNHB, for absorbed dose to graphite, and the PTB, for alanine dosimetry.

Many of the highlights of the BIPM programme were already presented by the Chairmen of Sections I and II earlier in the meeting (see Sections 6.2 and 6.3 above); notably in dosimetry the accelerator, mammography and brachytherapy comparisons and in radionuclide metrology the SIRTI and work on the robust evaluation of the KCRV. The current status of the project to obtain an accelerator at the BIPM had already been summarized by M. Kühne (see Section 5.2 above); P. Allisy added that the future strategy could include criteria for an NMI to consider having its own accelerator, which might for example be related to the number of clinical accelerators operating in their country.

The Picker ^{60}Co source was removed in July 2011 and the replacement head installed in November; authorization to import the new source had been very problematic but was expected to be acquired before the summer. Work continued on the construction of ionization chambers for various applications, allowing a more robust determination of chamber volumes. Work on an absorbed-dose standard for medium-energy x-rays was technically challenging and progressing slowly but steadily, and would be carried forward into the 2013–2015 programme.

An important offshoot of the calorimeter work was a determination of a new value for the product $W_{\mathrm{air}} s_{\mathrm{c,air}}$. This new value was incorporated into an analysis of all of the available data, resulting in a recommendation published in *Metrologia* in preparation for the ICRU Key Data report in 2013. International collaboration and knowledge transfer continues at a high level, for example through visits to the BIPM, external publications and participation in committees of the ICRU, the IAEA, the ICRM and the JCGM.

7 REPORTS FROM INTERNATIONAL STAKEHOLDERS

In addition to the international stakeholders presented below, representatives from the IRPA and the WHO had been invited but were unable to attend.

7.1 IAEA

A. Meghzifene outlined the four main dosimetric concerns of the IAEA: the use of new technologies, notably small fields, without proper standards and protocols; traceability of certain equipment, for example in nuclear medicine and brachytherapy, currently being only through manufacturers; education and training of staff working in calibration laboratories; limited communication between end users and calibration laboratories, who should be more proactive.

Among the short-term actions in the Strategic Plan, he identified three that address these concerns: the comparison of dose equivalent, the inclusion of SSDL results in the KCDB and the goal to increase dialogue between NMIs and DIs. The IAEA will continue to encourage SSDLs to establish formal links with NMIs, for example through Memoranda of Understanding, with specific recommendations to be included in the revised IAEA/WHO SSDL Charter. Among the medium-term actions strongly supported by the IAEA are developments for small-field dosimetry, for which the IAEA is currently collaborating with the American Association of Physicists in Medicine (AAPM) in developing a protocol, and the promotion of absorbed-dose standards. The percentage of IAEA audits of TLD based on beam calibrations using the IAEA TRS-398 absorbed-dose protocol was now around 85 %.

7.2 ICRU

B. Michael outlined the general role of the ICRU and its synergistic relationship with the BIPM. The ICRU continued to publish two reports per year, the most recent being Report 86, *Quantification and Reporting of Low-Dose and other Heterogeneous Exposures*, and Report 85-a, *Fundamental Quantities and Units for Ionizing Radiation*. Among the ten reports currently in preparation, that on *Key Data for Measurement Standards in Dosimetry* was highlighted. In this context, B. Michael noted the contribution of D. Burns to a number of reports and announced his recent election to the ICRU. He also noted that, while the ICRU and BIPM missions were well-aligned, there had in recent years been a strategic swing in the ICRU activities towards medical applications while keeping a foot in fundamental dosimetry.

7.3 IOMP

J. Chavaudra outlined the role and organizational structure of the IOMP, an umbrella organization representing 80 national member organizations, four established regional organizations (EFOMP in Europe, ALFIM in Latin America, AFOMP in Asia-Oceania and SEAFOMP in South-East Asia) and two further regional organizations under formation (MEFOMP in the Middle-East and FAMPO in Africa). The mission of the IOMP is to advance medical physics practice worldwide by disseminating scientific and technical information, by fostering the educational and professional development of medical physicists and by promoting the highest quality medical services for patients. The official journals of the IOMP include *Medical Physics World*, *Physics in Medicine and Biology*, *Medical Physics* and *Physiological Measurement*. J. Chavaudra finished by emphasizing the strong support of the IOMP for an accelerator at the BIPM.

7.4 Regional Metrology Organizations

Short presentations were made by Z. Msimang (AFRIMETS), J. Wu (APMP), H. Bjerke (EURAMET) and L. Karam (SIM). In each of these RMO presentations, links were made between the work of the RMO and the CCRI actions, demonstrating how the CCRI Strategic Plan serves its international stakeholders. The EURAMET presentation is available as CCRI/12-03, which is essentially a table showing directly the EURAMET activity related to each action of the CCRI Strategy Plan. A similar table was presented by J. Wu for the APMP. Document CCRI/12-08 presents a list of ionizing radiation comparisons with SIM participation.

8 FUTURE PROGRAMMES OF THE CCRI

With the CCRI Strategic Plan now in place, the creation of future programmes of work was simplified and was essentially a discussion of what medium-term actions to move into the new short term (2013-2015) and what existing short-term actions should be carried over. The new medium-term (2016–2019) and long-term (2020–2023) programmes should also be revised. K. Carneiro stated that he had accumulated most of the information necessary to do this and would meet with the Section Chairmen to finalize this at the end of the day.

One important point of discussion was the plan for an accelerator at the BIPM. A. Henson stated that the benefits of a BIPM accelerator were clearer for those NMIs that do not have their own accelerator; the argument needed to focus on those larger NMIs that already had their own accelerator. S. Picard pointed out that this benefit was comparisons, which were very much appreciated by those that had already taken part using the BIPM travelling standard (the NRC, PTB, NIST and LNE-LNHB); these comparisons could not continue long-term without the BIPM being able to maintain the calorimeter in its own reference accelerator beams. L. Karam suggested that for those large NMIs that were in support of an accelerator at the BIPM, the NMI representative on CCRI Section I could be asked to provide information on why they support the programme. M. Kühne agreed that this information would be helpful.

P. Allisy pointed out the direct cost of these comparisons, currently around 12 k€ per comparison excluding staff costs and overheads, and the need for comparisons to be repeated on a ten-year cycle. If economies were to be made, shared costs should be considered. The NMIs already paid for the return of the BIPM equipment, as stated in the protocol. One possibility was for NMIs to also fund the accommodation of the visiting BIPM staff. While agreeing to the general principle and its inclusion in the protocol as an option, P. Sharpe felt that it was for each NMI to consider this during pre-comparison negotiations. K. Carneiro agreed that the CCRI cannot decide on NMI spending and further stated the need to report the cost of piloting comparisons in relation to the Strategic Plan.

The role of brachytherapy comparisons was briefly discussed. P. Sharpe pointed out that comparisons of air-kerma standards for brachytherapy would need to be continued into the new short term, while the medium-term should address absorbed-dose standards and protocols for brachytherapy.

P. Allisy raised the subject of timing for the revised strategy, noting that June 2013 was the last chance for CCRI input to the programme for 2016–2019. M. Kühne further explained that the CGPM must decide on funding for the 2016–2019 programme of work at its meeting around October 2014, having been presented the programme earlier in 2014. The CIPM must therefore approve this at its meeting around October 2013, having received the first draft at its meeting in June 2013. P. Allisy concluded that the BIPM needed to prepare its 2016–2019 programme, in content if not budget, for presentation to the CCRI Section meetings in spring 2013. K. Carneiro stated that it was his intention to complete the new Strategic Plan before the end of 2012.

In a final comment, K. Carneiro reiterated that the ongoing key comparisons form the heart of the BIPM programme of work, taking up much of its resources, and must form a central part of the revised Strategic Plan.

9 REPORT TO THE CIPM

P. Allisy presented the CCRI document on validity criteria for comparisons, which had been through a number of iterations and was finally approved, with a few minor modifications, at the RMO Working Group meeting held the previous day. K. Carneiro pointed out that this decision was within the remit of the CCRI, who should inform the CIPM of its decision. **The validity of comparisons document was adopted by consensus.** C. Thomas congratulated the CCRI on this precise and well thought-out document, which would serve as an example to others. P. Allisy added that the original idea was that of I. Kharitonov from the VNIIM.

K. Carneiro pointed out that the CCRI Working Group on Strategy had now fulfilled its remit. **The Strategy Working group was closed by consensus.**

10–11 DATE OF NEXT MEETINGS / CONCLUDING REMARKS

K. Carneiro noted that with the growing number of meetings, there was little scope for re-scheduling of the proposed dates. **The following dates were agreed by consensus**:

CCRI(I) and Working Groups: 25–28 March 2013, CCRI(II) and Working Groups: 13–16 May 2013, CCRI(III) and neutron CMCs meeting: 24–26 April 2013, CCRI: 16–17 May 2013

In his closing remarks, K. Carneiro welcomed the openness of the stakeholders and regarded their input to the Strategic Plan as a contribution to the wider issues of governance and transparency. He closed the meeting by thanking all for their contributions.

D T Burns, *rapporteur*

First draft 2012-05-25

Final edit 2012-07-25

Appendix R1
Working documents submitted to the CCRI for its 23rd meeting

Documents restricted to Committee members can be accessed on the restricted website.

Document CCRI/	
12-00	Draft agenda – revised, K. Carneiro, 2pp.
12-01	CCRI Strategy Document, K. Carneiro, 24pp.
12-02	EURAMET progress report on the CCRI strategic plan, H. Bjerke, 2pp.
12-03	Draft Template for CC and CC WG Strategy Document for Rolling Programme Development, A. Henson, 2pp.
12-05	Validity of Ionizing Radiation Comparisons under the CIPM MRA, P. Allisy, 10pp.
12-06	CCRI(II) progress regarding the CCRI Strategic Plan at April 2012, L. Karam, 2pp.
12-07	Executive Summary from the CCRI(I) on progress re the CCRI Strategic Plan, April 2012, P. Sharpe, 2pp.
12-08	Comparisons in ionizing radiation with SIM participation, L. Karam, 2pp.
12-09	Summary Report on CCRI(III) activities relevant to the CCRI strategy, D. Thomas, 2pp.
12-10	Strategy paper for the CCRI - update for discussion in May 2012 – updated, K. Carneiro, 31pp.
12-11	Discussion paper on the CCRI response to rolling programme development, K. Carneiro, 4pp.
12-12	Discussion paper on references to the CCs in the CGPM a*d hoc* Group's report, K. Carneiro, 1p.
12-13	Actions by the APMP for the strategic plan of the CCRI up to 2020, Yuandi Yang, 5pp.
12-14	Ten-year CCRI(II) comparison plan for radionuclide metrology, L. Karam, 1pp.
12-15	Presentation of the CCRI(I), P. Sharpe, 11pp.
12-16	Presentation of the CCRI(II), L. Karam, 22pp.
12-17	Presentation of the CCRI(III), D. Thomas, 19pp.
12-18	The BIPM programme report, P. Allisy, 40pp.
12-19	Presentation of the IAEA, A. Meghzifene, 11pp.
12-20	IOMP presentation, J. Chavaudra, 14pp.