

## CCRI Report 2007 – to the CIPM

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1. The CCRI met on 31 May 2007 and was preceded by half-week meetings of each of its three sections, which were well attended by the Members and Observers, with very few apologies for absence. During the CCRI meeting there was general discussion on the work of the Sections, presented by the Chairmen, resulting in two explicit recommendations and proposal for new members. Each Section produced a list of recommendations and actions resulting from their meeting and these were agreed upon by the CCRI. In my report, there is obvious correlation between the work of the CCRI and the present and future work programmes of the BIPM.

### Section meetings

2. **The CCRI(I) meeting** from 14 to 16 May, was preceded by a well-attended and successful three-day workshop on air kerma and absorbed dose standards organized jointly by the LNE-LNHB and the BIPM. One of the outcomes of the workshop was a series of recommendations that were modified and then endorsed by the CCRI(I) and which identified outstanding issues that should be addressed by the NMIs or the BIPM in their future work programmes. Dr Caporaso of the Lawrence Livermore National Laboratory gave a very interesting invited lecture describing recent innovative work on developing a compact proton accelerator for radiation therapy, which will considerably increase the possibility for this treatment world-wide. Proton therapy needs absorbed dose standards and these are being addressed by the CCRI(I) and also **reflected in a change of name for the Section, see recommendation 1.**

3. The meeting endorsed the final value for the BIPM's revision to their standard for  $^{60}\text{Co}$  air kerma, which takes effect from 1 November 2007. They also agreed that the BIPM should begin using their higher activity  $^{60}\text{Co}$  source for comparisons and as the basis of their calibrations for NMIs. Section I endorsed the BIPM dosimetry programme and welcomed the move into new areas such as calorimetry, mammography and brachytherapy. There were several reports on the development of standards and measurement techniques for low-energy x-ray beams produced by synchrotron facilities. These indicated that the factor relating air kerma and exposure may need to be revised for these low-energy beams. The NMIs and the ICRU were invited to investigate this relationship.

4. The expansion of high-energy x-ray and electron facilities at the NMIs was highlighted by the announcement during the meeting of major new funding for the ARPANSA to acquire a clinical accelerator. The increasing number of accelerators at national laboratories highlighted the need for the BIPM to be involved in comparisons at these energies, ideally through the installation of an accelerator at the BIPM, and the CIPM proposal to the CGPM to initiate high-energy work at the BIPM was heavily endorsed. **The CCRI formally acknowledged the importance of a high-energy facility at the BIPM and endorsed the entry of the BIPM to the high-energy dosimetry field**

**at the earliest opportunity.** A proposal from the CIPM to make high-energy comparisons at an existing NMI facility was noted. The CCRI agreed that a meeting would be set up of representatives from interested NMIs to discuss the detailed logistics of such a comparison at least on an interim basis.

5. **The CCRI(II) meeting** from 23 to 25 May focused on activity comparisons and the future work programme of the BIPM. An impressive number of ampoules continues to be submitted to the SIR (about 20 per year) and the BIPM Quality System has been extended successfully to include the SIR. The new data acquisition system for the SIR has been run in parallel for 18 months and will replace the present system in 2008. Twelve comparison reports were published over the past two years, often including multiple results and regional linked comparisons. Key comparison reference values (KCRVs) are derived presently from unweighted means and seven KCRVs have been updated since 2005. In some cases the KCRV has been obtained or confirmed using the new mathematical measurement model for SIR efficiency curve, which is soon to be published as part of the BIPM *Monographie* series. The issue of using common values for the radionuclide decay parameters was also discussed with the benefits of using the BIPM *Monographie 5* series being highlighted. The NMIs have been made aware of the 21 radionuclide results that are reaching the end of their validity under the CIPM MRA 20-year rule for activity measurements.

6. An important CCRI(II) publication last year was the Generic Groupings table, categorizing 152 radionuclides according to appropriate measurement methods, with the level of difficulty of measurement being colour-coded, and a practically realizable expanded uncertainty also being indicated. This is an active and evolving document, published on the CCRI(II) web page. A CCRI(II) resolution was adopted whereby any change to the table that could impact on the supporting evidence for CMCs would be made known one month in advance to laboratories affected by the change.

7. The CCRI(II) has a ten-year plan for activity comparisons and the  $^{55}\text{Fe}$  comparison (2006) was complete. The  $^{85}\text{Kr}$  gas is scheduled for 2007 and  $^3\text{H}$  re-scheduled for late 2008 due to difficulties in providing the samples. An additional, important radionuclide  $^{177}\text{Lu}$  will form the object of a comparison in early 2008 and consequently,  $^{35}\text{S}$  is moved back in the programme to 2009 and  $^{131}\text{Cs}$  to 2011.

8. The radionuclide technetium-99m is the most commonly used medical radionuclide in every Member State. However due to its short half-life (about 6 h), only those NMIs that are reasonably close to the BIPM have been able to participate in an SIR comparison. To extend this possibility to other NMIs geographically far from the BIPM, an SIR transfer instrument is under development, and the preliminary tests have been successful so that a  $^{99}\text{Tc}^{\text{m}}$  comparison is now planned as an ongoing exercise using this transfer instrument. This system will also work for other short-lived gamma-emitting radionuclides such as  $^{18}\text{F}$  extensively used in PET imaging.

9. There are several RMO activity comparisons in progress or planned: EUROMET  $^{237}\text{Np}$ , APMP  $^{134}\text{Cs}$  and  $^{133}\text{Ba}$  and COOMET  $^{241}\text{Am}$ ; APMP  $^{131}\text{I}$  and  $^{14}\text{C}$  and COOMET

<sup>137</sup>Cs. Progress on supplementary comparisons of Standard Reference Materials was also presented, three of these being piloted by the NIST and two by the IAEA.

10. The members of Section II were satisfied with the current and future BIPM programmes, although some concern was expressed over the time taken to get the Extended SIR for pure beta emitters operational. Two liquid scintillation methods are being studied jointly with the NMIs and results should be available within the next programme.

11. **The CCRI(III) meeting** from 29 to 31 May included two seminars and the resolution of some outstanding issues related to comparison results. The seminars “*Evolution of neutron source strength measurements intercomparisons*” and “*Future challenges in neutron metrology*,” were presented by the VNIIM and the previous Chairman, respectively. Both provided input to future work programmes as the former implied that there were still many present challenges in neutron metrology to be resolved

12. Final reports for two completed key comparisons, a fast neutron fluence rate comparison and a neutron source emission rate comparison, are nearing completion. The final report for a key comparison at 24.5 keV carried out in the nineties is due to be prepared by the end of 2007 with assistance from the BIPM. **Although this comparison is now ten years old, it cannot be repeated until 2011 so an extension of its validity is required – see recommendation 2.** A key comparison of thermal neutron fluence rate measurements is in progress and running well. Two supplementary comparisons led by the EUROMET, but also involving other RMOs as participants, were discussed; these involve survey meter calibrations and neutron fluence rate measurements in the range 15.5 MeV to 19 MeV.

13. Brief reports were presented by most of the participants, highlighting their written reports that had been submitted as working documents for the meeting. The scientific discussions resulting from these interchanges are a strongly appreciated feature of the CCRI(III) meetings.

### ***Metrologia* Special Issues**

14. Three special issues of *Metrologia* are being produced to demonstrate the achievements and successes in the areas of interest to the three CCRI sections and these special issues coincide with the 50th anniversary of the CCRI.

15. The special issue of *Metrologia* produced by the CCRI(II) for radionuclide metrology was published in September 2007. This issue comprises three sections: (i) implementation of the CIPM MRA in radionuclide metrology, (ii) the state-of-the-art of radionuclide metrology (the largest section) and (iii) traceability. It presents a general overview on operational and state of the art of radionuclide metrology with nineteen contributions.

16. The CCRI(I) is well advance in the production of its special issue of *Metrologia* on the metrology of radiation dosimetry, which should be published in late 2008. The

CCRI(III) is currently planning the contents of their special issue on neutron metrology with a projected date of 2009.

## Membership proposals

16. The KRISS, who had applied for membership of the CCRI(III) in 2005, have demonstrated their level of commitment by involvement in two comparisons and Section III recommends them as full members. **The CCRI agreed that there was no need for a re-application from the KRISS.**

17. The request by the BEV for Observer status on CCRI(II) was supported by the CCRI following the presentation of the BEV facilities and equipment by Dr F. Maringer. In addition, the CNEA is planning to apply as an Observer on CCRI(I) and CCRI(II). The CIEMAT presented their plans for a neutron facility and were encouraged to apply for Observer status on CCRI(III).

## Working Groups

18. The CCRI(I) has two Working Groups. The Key Comparisons WG (KCWG) has operated through electronic communication to date and was restructured under the new coordinator, Dr P. Sharpe (NPL) in May 2007 with a view to holding a meeting in 2008. The Brachytherapy WG has met once (coordinator Dr P. Allisy, BIPM) and their main remit was to organize the protocols for two brachytherapy key comparisons, one on  $^{192}\text{Ir}$  wire and one on  $^{125}\text{I}$  seeds. A previous working group on air-kerma correction factors was disbanded following the adoption of new values by almost every NMI.

19. The CCRI(II) has six Working Groups. The KCWG(II) under the new leadership of Dr L. Karam (NIST) has met three times in the past two years. This WG's major task has been the finalization of the Generic Groupings Table for publication. In addition they review the KCRVs and the key comparison reports before they are submitted to the CCRI(II) for final approval. They also ensure the validity of comparison protocols.

20. The coordinator of the CCRI(II) Uncertainties WG, Dr H. Janssen (PTB), announced his retirement and after thanking him for his important contributions the CCRI(II) appointed Dr M. Unterweger (NIST) as the new coordinator. An Uncertainties Workshop will be held mid-2008 in conjunction with a Comparisons Workshop. Practical exercises will be prepared to help the participants identify any problem areas.

21. The WG on the extension of the SIR to beta-emitters (ESIR) met twice under the leadership of Dr J.M. Los Arcos (CIEMAT) to discuss the preparation of liquid scintillation cocktails for the eventual extension of the SIR for pure beta emitters. There are still several problems to be solved on this issue.

22. Progress on the realization of the becquerel using a reproducible ion chamber design was reported, this WG having met just prior to Section II under the leadership of

Dr U. Wätjen (IRMM). Various technical details need to be addressed over the next year with the final production envisaged within three years.

23. Progress was also presented on the SIR transfer instrument WG set up under the leadership of Dr C. Michotte to provide a comparison system for short-lived radionuclides. The system, comprising a well-type NaI(Tl) detector, a  $^{93}\text{Nb}^m/^{94}\text{Nb}$  check-source and counting electronics, has been tested using  $^{99}\text{Tc}^m$  and further testing using  $^{99}\text{Mo}$  is planned for the impurity content in  $^{99}\text{Tc}^m$ . This should be in use for the first NMI on-site comparison at the beginning of 2008.

24. The co-ordinator and currently the sole member of the WG on high-efficiency photon detection systems was unable to attend the Section II meeting, but explained the delays due to other commitments. The purpose of this WG is to produce a BIPM *Monographie* on such detection systems and as the CCRI(II) is very keen that this work should be accomplished, Dr F. Maringer from the BEV was coopted onto the WG to encourage Prof. Winkler in this work and co-author the *Monographie* as appropriate.

25. The CCRI(III) has one Working Group, on Key Comparisons. The previous coordinator completed the major task of this group by producing the final report on the neutron fluence comparisons - CCRI(III)-K10. These results are now published in the KCDB and as the coordinator has retired, the Chairman of the CCRI(II), Dr D. Thomas has been appointed as the coordinator for future work of the KCWG(III).

### **Dates proposed for the CCRI meetings in 2009**

26. The CCRI requests that its next meeting is held in 2009. The 50th anniversary of the CCRI will occur in 2009 and a celebration is being planned to coincide with the CCRI meetings of that year. The dates will need to be decided by the CIPM in due time before the meeting plans are announced.

## **RECOMMENDATIONS OF THE CONSULTATIVE COMMITTEE FOR IONIZING RADIATION**

### **RECOMMENDATION R-1 (2007): Change of name for the CCRI(I)**

The CCRI

#### **considering**

- that electrons are not the only charged particles of interest to the CCRI(I)
- the need for the CCRI(I) to provide advice and guidance on the dosimetry of proton beams
- the scope of the work of the NMIs in the dosimetry of other charged particles

#### **recommends**

that the name of Section I be changed from “x- and  $\gamma$ -rays, electrons” to “**x- and  $\gamma$ -rays, charged particles**”.

**RECOMMENDATION R-2 (2007):**

**Extension of validity of the CCRI(III)-K1 key comparison of neutron fluence measurements at 24.5 keV**

The CCRI

**considering**

- the recommendations of the ISO for measurements at this energy,
- the need for this comparison to be published in the BIPM key comparison database (KCDB) to support the calibration and measurement capabilities (CMCs) of the participants,
- the difficulties in transporting an Am/Be source to the National Metrology Institute (NMI) participants,
- the three years that this comparison took to run,
- the further work that was required of the participants by the CCRI(III) to resolve some measurement issues,
- that this comparison was started before the CIPM MRA was signed,

**recommends** that on condition that this comparison is published before the end of 2007, the validity of the CCRI(III)-K1 comparison be accepted in support of CMCs for an extended period from the usual ten years for a further five years until 2011, when the comparison can be repeated as part of a series of fluence measurements at different neutron energies that will be carried out by all the participants at the pilot laboratory.