Bureau International des Poids et Mesures

Consultative Committee for Photometry and Radiometry (CCPR)

Report of the 18th meeting
(25 – 26 October 2005)
to the International Committee for Weights and Measures

Comité international des poids et mesures

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Note:

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

Full bilingual printed versions in French and English will no longer appear.

T.J. Quinn,
Director BIPM,
November 2003

LIST OF MEMBERS OF THE CONSULTATIVE COMMITTEE FOR PHOTOMETRY AND RADIOMETRY AS OF 25 OCTOBER 2005

President

Dr F. Hengstberger, member of the International Committee for Weights and Measures, CSIR-NML, Pretoria.

Executive Secretary

Dr M. Stock, International Bureau of Weights and Measures [BIPM], Sèvres.

Members

Centre for Metrology and Accreditation [MIKES], Espoo.

Conservatoire National des Arts et Métiers, Institut National de Métrologie [LNE-INM], Paris.

CSIR, National Metrology Laboratory [CSIR-NML], Pretoria.

Institute for Opto-Physical Measurements, Rostekhregulirovaniye of Russia [VNIIOFI], Moscow.

Instituto de Física Aplicada, Consejo Superior de Investigaciones Cientificas [IFA-CSIC], Madrid.

Istituto Nazionale di Ricerca Metrologica [INRIM], Turin.

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

Measurement Standards Laboratory of New Zealand [MSL], Lower Hutt.

National Institute of Metrology [NIM], Beijing.

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

National Measurement Institute of Australia [NMIA], Lindfield.

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

National Office of Measures/Országos Mérésügyi Hivatal [OMH], Budapest.

National Physical Laboratory [NPL], Teddington.

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

NMi Van Swinden Laboratorium, Nederlands Meetinstituut [NMi VSL], Delft.

Physikalisch-Technische Bundesanstalt [PTB], Braunschweig.

Slovak Institute of Metrology/Slovenský Metrologický Ústav [SMU], Bratislava.

Swiss Federal Office of Metrology and Accreditation [METAS], Wabern.

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

Observers

Centro Nacional de Metrología [CENAM], Queretaro.
National Metrology Institute/Ulusal Metroloji Enstitüsü [UME], Gebze-Kocaeli.
Standards, Productivity and Innovation Board [SPRING Singapore], Singapore.

1 OPENING OF THE MEETING; APPOINTMENT OF THE RAPPORTEUR; APPROVAL OF THE AGENDA

The Consultative Committee for Photometry and Radiometry (CCPR)* held its 18th meeting at the International Bureau of Weights and Measures (BIPM), Sèvres, on Tuesday 25 October and Wednesday 26 October 2005. Four sessions were held.

The following were present: G. Andor (OMH), M. Ballico (NMIA), J. Bastie (LNE-INM), A. Bittar (MSL), P. Blattner (METAS), J. Clare (MSL), A. Corróns (IFA-CSIC), J. Dubard (LNE), N.P. Fox (NPL), E. van der Ham (NMi VSL), F. Hengstberger (President of the CCPR, CSIR-NML), E. Ikonen (MIKES), In Won Lee (KRISS), J. Metzdorf (PTB), A. Mito (NMIJ/AIST), P. Nemeček (SMU), Y. Ohno (NIST), S.N. Park (KRISS), M.L. Rastello (INRIM, formerly IEN), T. Saito (NMIJ/AIST), W. Schmutz (METAS), N. van Tonder (CSIR-NML), G. Ulm (PTB), A.J. Wallard (Director of the BIPM), E. Woolliams (NPL), J. Zwinkels (NRC).

Observers: C. Matamoros (CENAM), F. Sametoglu (UME), G. Xu (SPRING).

Also attending the meeting: I.B. Couceiro (INMETRO), M. Matveyev (VNIIM); M. Stock (Executive Secretary of CCPR, BIPM), and C. Thomas (BIPM).

Apologies were received from A. Parr (NIST), V. Sapritsky (VNIIOFI), and Y. Lin (NIM).

The President opened the meeting, welcoming representatives, observers and invited guests. The President invited the BIPM Director to address the meeting. Professor Wallard welcomed all to the BIPM for this 18th CCPR meeting.

The president gave each attendee the opportunity to introduce him/herself.

Joanne Zwinkels was appointed as rapporteur for the meeting. The 2nd draft agenda distributed before the meeting was accepted by the members. The President proposed the addition of a new agenda item on the periodicity of key comparisons. Four additional agenda items were proposed by the President on the following morning. These new agenda items are listed below:

- Key comparison periodicity;
- CIPM Consultative Committees general rules and policy;
- Strategic Planning Working Group;
- Event on metrology and climate change;
- Documents on open website and organization of documents.

* For the list of acronyms, click here

2 APPROVAL OF THE MINUTES OF THE LAST MEETING

The minutes of the previous meeting were accepted without changes.

3 MATTERS ARISING

The following actions arising from the 17th meeting have been carried out:

- The CCPR Working Group on CMCs (WG-CMC) has identified the Round 3 CMCs and this review process has been carried out.
- The President has summarized the focus areas that national metrology institutes (NMIs) identified in their response to the questionnaire. This will be discussed in Section 6.
- We have regional metrology organizations (RMOs) represented at this meeting of the CCPR and will be giving reports on RMO activities.

The addition of an Appendix on photobiological units in the SI Brochure will be discussed in Section 14.

4 DOCUMENTS PRESENTED TO THE MEETING

The Executive Secretary presented the list of 11 working documents to the meeting. Subsequent to the meeting, two working documents, CCPR/05-12 and -13 were added. The complete list of these working documents is given in Appendix P 1. Dr Fox requested that the NPL response to Dr Parr's CCPR working documents, CCPR/05-03 and -04 (on the use of the weighted means in CCPR comparisons), be added to the list of CCPR working documents (CCPR/05-13). This document has already been posted as part of the CCPR Working Group on Key Comparisons (WG-KC) documents (CCPR WG-KC/05-11).

5 CCPR CODE OF PROCEDURE FOR WORKING GROUPS AND TASK GROUPS

The draft 3 of the CCPR Code of Procedure for Working Groups and Task Groups (CCPR/05-09) dated June 2005, was accepted unanimously.

6 REVIEW OF PROGRESS IN THE LABORATORIES

The President said that 19 replies had been received to the CCPR questionnaire 2005 and that he was thrilled with the work being carried out in the laboratories. He encouraged the attendees to disseminate this information broadly to staff in their laboratories. Because of time constraints, he encouraged the oral presentations to be limited to 10-15 minutes per laboratory. The representative of each NMI represented at the meeting gave an overview of their laboratory's reply to the questionnaire sent out prior to the meeting. The written replies are given in working document CCPR/05-02. The discussions that followed some of the presentations are reported below.

CENAM: Dr Matamoros presented the progress made by CENAM.

No comments were received on this presentation.

CSIR: Ms. van Tonder presented the progress made by CSIR.

No comments were received on this presentation.

HUT: Prof. Ikonen presented the progress made by MIKES (formerly HUT).

Dr Fox had a technical comment about the differences between the integrating sphere and goniophotometric methods for realizing absolute diffuse reflectance scales and whether this could be ascribed to effects of stray radiant energy. He noted that a systematic difference of 0.3 % has been observed between these two methods by NPL, NIST and PTB. Professor Ikonen remarked that more research is needed to determine if these differences are real but, in their case, the residual differences, after accounting for stray light effects were now within their measurement uncertainties.

INRIM: Dr Rastello presented the progress made by INRIM (formerly IEN).

The President asked about the reorganization of their institute and how metrology work was regarded within this new research laboratory. Dr Rastello said that IEN and IMGC will merge into one large institution, called Istituto Nazionale di Ricerca Metrologica (INRIM, National Institute for Research on Metrology), on 1 January 2006. INRIM is under the guardianship of the Italian Ministry of Education, University and Research (MIUR), the aim being the promotion and development of research activity in the field of metrology. INRIM will act also as national primary institution in all fields traditionally pertaining to IMGC and IEN, respectively.

IFA-CSIC: Dr Corróns presented the progress made by IFA-CSIC.

The President asked for clarification on the name and mandate of the organization. Dr Corróns stated that the Institute of Applied Physics (IFA) is a member of the Consejo Superior de Investigaciones Cientificas (CSIC) and its main objective is scientific research. The metrology department of the IFA-CSIC works mainly in photometry, radiometry, colorimetry and optical fibre metrology.

KRISS: Dr Park presented the progress made by KRISS.

Dr Ohno had a technical question on the 0.28 % difference reported on the color correction factor for the illuminance scale comparison and asked if this could be due to a difference in bandpass or wavelength scale calibration. Dr Park indicated that they had used a 4.0 nm bandwidth but did not take account of this effect. Dr Ohno said that, in their experience, a 0.1 % difference could be accounted for by bandpass effects. Professor Ikonen commented that uncertainties should also be given to determine if these observed differences were significant. The Director asked if the ageing effect shown for the three white LEDs was well-understood. Dr Park said that this was largely due to a temperature effect during ageing.

LNE: Dr Bastie presented the progress made by LNE (formerly BNM).

Dr Saito raised technical questions about the operating temperature for the avalanche photodiodes and whether these were cooled. Dr Bastie reported that the APDs were used at ambient temperature (23 °C) but that the quantum-type used in the photon counting measurements are cooled to -20 °C.

The President was interested in the total radiance measurements being carried out at LNE and asked if they were the same type as being carried out at VNIIM. Dr Bastie confirmed that it was similar and that the application was for the calibration of heat-flux meters. The President then asked if they are looking to have this measurement capability included in their list of CMCs. Dr Bastie said that this was not being considered at this time, but that they were interested in a possible measurement comparison.

METAS: Dr Blattner presented the progress made by METAS.

No comments were received on this presentation.

MSL: Dr Clare presented the progress made by MSL.

No comments were received on this presentation.

NIST: Dr Ohno presented the progress made by NIST (Gaithersburg).

Dr Saito asked whether there exists a difference between detector responses for pulsed and cw-lasers at the SIRCUS facility, with regard to the use of the frequency-multiplied Ti-sapphire laser source. Dr Ohno said that he was not involved in these experiments and could not comment. Dr Fox mentioned that he had carried out similar experiments and, at the 0.4 % level, there was little difference between pulsed and cw operation.

The Director asked about the industry-funded research being carried out at NIST on water disinfection and retroreflection. Dr Ohno said that NIST is involved in defining guidelines for UV sensors used in water disinfection that would require a calibration scheme with traceability to national standards. The Director asked for clarification why the retroreflection services were specifically described as “official” services and whether manufacturers of these devices in the United States were required to have them calibrated by NIST. Dr Ohno answered that it will be

required by regulations in the United States. The Director also asked for information about a satellite workshop at NIST to resolve differences between satellite-based measurements for space applications. Dr Ohno said that he did not know the details of this progress. Dr Fox confirmed that there had been progress in the United States with the NOAA now requiring SI traceability on specific measurements and that the report of the NIST workshop was not yet completed.

NMi VSL: Dr van der Ham presented the progress made by NMi VSL.

No comments were received on this presentation.

NMIA: Dr Ballico presented the progress made by NMIA.

The Director asked about the target uncertainty for the temperature measurements of the blackbody using filter radiometers and with the ITS-90 *via* pyrometry. Dr Ballico said that 15 mK was the target and that the main problem was in characterizing the pyrometer.

NMIS/AIST: Dr Saito presented the progress made by NMIJ/AIST.

No comments were received on this presentation.

NPL: Dr Fox presented the progress made by NPL.

Dr Rastello asked what the Internet calibrations offered by NPL were used for. Dr Fox said that these were used in spectrophotometry for applications such as the pharmaceutical industry that require regular routine checks of the measurement results. He said that he had not emphasized this new NPL service in his report since there has been zero take-up. His conclusion is that there is presently no perceived need for this service.

NRC: Dr Zwinkels presented the progress made by NRC.

No comments were received on this presentation.

OMH: Dr Andor presented the progress made by OMH.

No comments were received on this presentation.

PTB (Berlin): Dr Ulm presented the progress made by PTB (Berlin).

Dr Saito asked a technical question about the uncertainty values reported below 0.1 % for the synchrotron radiation and asked about characterizing the beam diffraction and scattering error, particularly in the visible region. Dr Ulm said that these were calculated uncertainties based upon the system parameters and upon experience with BESSY I and II.

PTB (Braunschweig): Prof. Metzdorf presented the progress made by PTB (Braunschweig).

Dr Bittar asked if there are opportunities for collaborating in the iMERA Project if the laboratory was not a member of EUROMET. Professor Metzdorf said that this was not a problem, in principle, except that only EUROMET members were eligible to receive funding for participation in these projects.

SMU: Dr Nemeček presented the progress made by SMU.

No comments were received on this presentation.

SPRING (Singapore): Dr Xu presented the progress made by SPRING.

No comments were received on this presentation.

UME: Dr Sametoglu presented the progress made by UME.

Upon the question of Dr Ohno how UME realizes the luminous flux scale, Dr Sametoglu explained that they use an integrating sphere and luminous flux lamps, calibrated at PTB. They plan to construct a goniophotometer with 5 m diameter for the absolute realization of the lumen. UME has carried out an informal bilateral comparison of luminous flux with PTB in 2001.

Oral presentations on the progress made by **NIM, VNIIOFI** and **NIST** (Boulder) were not given as no representatives from these institutes were in attendance at this meeting.

The President thanked everyone for the preparation of the reports and PowerPoint presentations. Later in the meeting, it would be decided what presentations will be on an open BIPM website and what presentations will be protected by password.

The President summarized some of his general impressions from the laboratory presentations. Firstly, the CCPR needs to have more activities in the areas of fibre optics, calibration of broadband detectors (e.g. UVA), LEDs, low level photometry (photon counting), photometry and colorimetry of displays and laser power and energy. He also noted that many laboratories are involved in radiation thermometry and that the CCPR needs to recognize the overlap between photometry, radiometry and thermometry and that radiation thermometry requires the skills and expertise available in the photometry and radiometry community. He asked Dr Fox, Chairman of a Task Group on WG-KC, to comment on this in his report.

Professor Metzdorf asked if the future work of the CCPR will include more and more applied activities rather than more fundamental work. The President indicated that the subject of CCPR future activities would be discussed later in the agenda.

The Director informed the members that a paper would be distributed at lunch-time, working document CCPR-05/12, which was developed by the CIPM at its meeting three weeks ago and approved as general guidance on the work of the Consultative Committees, including membership and terms of reference. One of the key recommendations was for the CCs to develop long-term work plans with a balance between different activities and to think about general strategic issues on a 5-10 year time frame, e.g. the periodicity of comparisons. The CCPR is the first meeting after the approval of this CIPM policy document and an action plan in response to this document is required. For example, the CCPR could consider holding targeted workshops or create a working group on setting strategic priorities. At the next meeting of the CCPR, a long-term work program needs to be developed.

The President suggested a change in the order of the agenda items (moving the report from the UV working group after the review of progress in the laboratories) to complete one more agenda item before the end of the day.

7 REPORT FROM THE WORKING GROUP ON UV RADIOMETRY (WG-UV)

Prof. Ikonen gave the report. The working group met on the morning of 25 October 2005 and there were 18 participants present. The following topics 1-3 are included in the working programme of the Working Group on UV Radiometry:

- Coordinated research to look for suitable diffuse reflectance transfer standards for the UV. The task group members are: NIST, NMIJ, NPL, OMH, PTB, and VNIIOFI, with NPL (Dr Fox) as coordinator. Related to this topic, it was agreed that Dr Fox will send a questionnaire to the other group members by the end of 2005. The questionnaire will ask for a list of candidate materials that can be declared, measured facilities available and planned, time scale of contributing to this activity, data which is available already now, and exposure facilities available for aging the materials.
- Coordinated research on UV and VUV transfer standard detectors. The task group members are: NIST, NMIJ, NPL, PTB, and VNIIOFI, with PTB (Dr Ulm) as coordinator.
- A comparison of spectral responsivity in the VUV range, 10 nm to 250 nm. The participants are NIST, NMIJ, PTB, and VNIIOFI with PTB (Dr Ulm) as the pilot laboratory.

Dr Ulm has circulated a questionnaire concerning the latter two topics and on the basis of these replies, he has proposed a pilot comparison to be started in April 2006 in the limited spectral interval of 10 nm – 20 nm. The transfer standards in this spectral range are sufficiently reliable and there is an urgent need to confirm worldwide equivalence of spectral responsivity measurements in this wavelength range which is important for semiconductor manufacturing.

The working group has agreed that PTB should start the comparison and act as the pilot laboratory. The participants of this pilot comparison are NMIJ and possibly NIST. NIST, NMIJ, and PTB will form the task group for the comparison. Dr Ulm will prepare the first draft of the technical protocol and send a registration form of this pilot comparison to the BIPM.

Another potential pilot comparison over the spectral range of 110 nm – 200 nm was also discussed. The reliability of transfer standard detectors in this spectral range still needs to be studied. The working group recommends that PTB and NIST start a bilateral comparison in this spectral range as soon as possible.

A spectral responsivity key comparison over the wavelength range 10 nm – 250 nm will be discussed again when the results of the comparisons in the limited spectral range are available.

Due to time constraints, the agenda item on a new CMC service category for UVA responsivity, was not discussed. The next meeting of the working group will be held before the next CCPR meeting in 2007 at the BIPM.

8 REPORT OF THE WORKING GROUP ON CALIBRATION AND MEASUREMENT CAPABILITIES (WG-CMC)

Dr Matamoros gave the report of the Working Group on Calibration and Measurement Capabilities.

The working group met on the 24 October 2005 at the BIPM. Representatives from all five RMOs (APMP, COOMET, EUROMET, SADCMET and SIM) were present as well as 18 observers from NMIs and the BIPM, the President of CCPR and the Executive Secretary of the CCPR. Dr Espina and Dr Thomas of the BIPM gave a presentation on "Feedback from the JCRB". They clarified the procedures required to make changes on CMCs, the criteria for acceptance of CMCs (as defined by the JCRB) and the management of the database.

The third round CMCs from APMP have been approved and those from EUROMET are under review.

Based on the information given at the meeting by Pedro Espina and Claudine Thomas, Dr Matamoros provided statistics on the inter-regional review process in the field of radiometry and photometry. There are currently 37 countries with CMCs published, over 1000 CMCs have been reviewed and a total of 846 CMCs are in the BIPM public database. CMCs are not published in the public database if the associated quality system has not been approved.

The RMO coordinators agreed to submit CMCs for the interregional review once a year, in March. Each region needs to define when to start the corresponding intraregional review process. The annual meeting of WG-CMC will be used to address those issues, which could not be solved during the normal review process.

Dr Matamoros reported that there has been a request from COOMET to review the CMC service categories to include total irradiance. This request will be discussed jointly with CCT through the CCPR liaison to CCT, Dr Fox. APMP feels a need to include service categories for UV irradiance and heat flux.

Another important issue that has been raised within the working group is the review of CMCs based on results of key comparisons. There is a request for the JCRB to clarify the meaning of "best measurement capability" and to provide guidance for the review of CMCs based on new comparison results. Also, experiences from other CCs will be used. As soon as the information is obtained, the WG-CMC will propose some procedure for the reviewing process.

The following comparisons have been completed since the last meeting of the working group:

- CCPR-K2.b on spectral responsivity (BIPM), 300 nm – 1000 nm;
- CCPR-K3.a.1 on luminous intensity (NMIA), bilateral with SPRING;
- CCPR-K3.b.1 on luminous responsivity (NMIA), bilateral with SPRING;
- CCPR-K3.b.2 on luminous responsivity (HUT), bilateral with KRISS;
- EUROMET.PR-K3.b.1 on luminous responsivity (IFA), bilateral with UME.

At the next working group meeting in 2006, APMP will take on the Chairmanship of WG-CMC. The President said that the outgoing and incoming Chairman will finalize the agenda for these meetings together.

9 REPORT OF THE WORKING GROUP ON KEY COMPARISONS (WG-KC)

Dr Ohno gave the report. The working group met on 23-24 October 2005 at the BIPM. The working group Chairman, Dr Parr, resigned from the chairmanship prior to the meeting and the meeting was chaired by Dr Ohno at the request of the CCPR President.

There were 25 attendees at the meeting, with all NMI members present except for NIM and VNIIOFI.

The membership of this working group is as follows:

- Members: NMIA, KRISS, NMIJ, NIM, NIST, NPL and PTB;
- Ex-officio members: CCPR President, Executive Secretary of CCPR;
- Temporary members: pilot laboratories of on-going CCPR key comparisons: LNE;
- Observers: RMO representatives (APMP COOMET, EUROMET, SADCMET, SIM) and all other official CCPR members and observers.

A request was received from NRC Canada to be added to the membership of the working group. The WG-KC agreed to develop criteria for membership before accepting this request. Dr Ballico will prepare a draft and will lead this discussion by e-mail. Dr Ohno gave a target date of the end of 2005 for a recommendation from the WG-KC to the full CCPR.

The following status reports were given by chairs of on-going key comparisons:

9.1 CCPR-K1, Spectral irradiance

9.1.1 CCPR-K1.a, 250 nm – 2500 nm (NPL, contact: E. Woolliams)

Draft B was submitted for WG-KC approval in April 2005. A concern was raised by the Chairman of WG-KC that the model used for the data analysis was very complicated and not transparent. Consequently, the results could not be reproduced and it was unclear how data were analyzed. To resolve this concern, NPL and NIST collaborated and two appendices were prepared for inclusion in the draft B report. These appendices are:

- Appendix B: A guide to the analysis approach;
- Appendix C: An alternative analysis of comparison results using a simple method.

The new draft (B-1) with these appendices was submitted to WG-KC in October 2005. The working group approved the draft B-1 with one change: the removal of the last paragraph in Appendix B. This revised version (draft B-2) will be forwarded to CCPR for approval.

Dr Woolliams gave a report explaining the procedure used for carrying out the data analysis for CCPR-K1.a.

The President asked about the recommended deadline for approving the draft B report. The Executive Secretary said that 6 weeks seemed adequate for a report of this length. Dr Thomas asked how these results were to be put into the database. Dr Fox said that each wavelength is to be considered as a separate comparison and that it will require 44 different matrices in the database. Dr Thomas asked for these data to be provided in an Excel spreadsheet.

9.1.2 CCPR-K1.b, 200 nm – 350 nm (PTB, contact: J. Metzdorf)

All measurements have been completed and most of the results have been received. PTB is waiting for results from one NMI. Analysis will start following the Guidelines for CCPR Comparison Report Preparation (draft 5). Pre-draft A process is being prepared.

9.2 CCPR-K2, Spectral responsivity

9.2.1 CCPR-K2.a, 900 nm – 1600 nm (NIST, contact: S. Brown)

The task group met at NIST in May 2004 and several changes were proposed and agreed upon. Draft A-2 was prepared and distributed to all participants on 15 October 2005. Response (approval or comments) is requested by 30 November 2005.

9.2.2 CCPR-K2.c, 200 nm – 400 nm (PTB, contact: L. Werner)

Fourteen NMIs are participating in this comparison. Measurements are progressing in three phases. The second phase is near completion and all measurements are scheduled for completion by June 2006. The draft A report is expected in 2007.

The task group met in Davos and discussed how to analyze results from two types of photodiodes in the range 250 nm – 400 nm. The TG agreed that they will wait until all measurements are completed and relative data are examined before deciding on the analysis procedure. The pilot laboratory will propose an analysis plan at the pre-draft A stage.

9.3 CCPR-K5, Spectral diffuse reflectance (NIST, contact: J. Fraser)

Eleven NMIs are participating in this comparison. The comparison artefacts were three Spectralon and three matte ceramic plates. All the measurements have been completed and all the results received (August 2005). Data analysis is in progress for pre-draft A stage process. Fluorescence of some ceramic tile samples was observed at early stages of the comparison and will be noted in the data analysis.

9.4 CCPR-K6, Spectral regular transmittance (LNE-INM, contact: J. Bastie)

Fifteen NMIs are participating in this comparison. The comparison artefacts were five neutral density glass filters of nominally 92 %, 56 %, 10 %, 1 % and 0.1 % transmittance that were measured at eight specified wavelengths from 380 nm to 1000 nm. All the measurements are complete and results received. The pre-draft A process was conducted following the Guidelines for CCPR Report Preparation (draft 4) which involved a review of uncertainty budgets and relative data. The draft A report is to be distributed around the end of 2005.

9.5 CCPR bilateral key comparisons

9.5.1 CCPR-K1.a.1 (NMIA – SPRING)

Draft B was submitted to WG-KC in June 2005. It is on hold until CCPR-K1.a draft B is approved.

9.6 Reports on progress of supplementary comparisons

9.6.1 CCPR-S1, Spectral radiance (VNIIOFI, contact: V. Sapritsky)

No report was given.

There was some general discussion about the status of this comparison and the President asked the members for alternatives to these delays. Dr Ohno said that the CCPR Guidelines should be followed regarding timelines although some rules may not apply to supplementary comparisons. The President encouraged the participants of this comparison to form a task group and contact the pilot laboratory. The working group Chairman will contact VNIIOFI to ask the status and request prompt start of preparing the report.

9.6.2 CCPR-S2, Aperture area (NIST, Contacts: T. Litorja and J. Fowler)

Eight NMIs are participating in this comparison. The samples were four knife-edge and four land-type round apertures, 6 mm and 25 mm in diameter. The pre-draft A process was followed. Draft A was distributed in May 2005 with a deadline of 30 June 2005. Comments were received from BIPM, HUT and PTB. NIST sent the responses to these comments to all participants on 13 October 2005, requesting comments by 12 November 2005. The draft A-2 is to be distributed by the end of 2005.

9.6.3 CCPR bilateral supplementary comparisons

Two additional bilateral comparisons for CCPR-S3 (cryogenic radiometers) are prepared by NPL, with the participants SPRING and UME.

9.6.4 Discussion on the future of CCPR supplementary comparisons CCPR-S1 to CCPR-S3

There will no longer be CCPR supplementary comparisons. The working group discussed whether the following comparisons need to be repeated, and whether any of them should be moved to key comparisons:

- CCPR-S1, Spectral radiance, 220 nm to 2500 nm;
- CCPR-S2, Aperture area;
- CCPR-S3, Cryogenic radiometers.

The WG-KC agrees that none of these comparisons need to be changed to a key comparison. It was proposed that future repetition of these comparisons should be classified as RMO supplementary comparisons.

9.7 Reports from the RMOs on comparison activities

This is reported in section 11.

9.8 Proposals for new comparisons

Pilot comparisons of spectral responsivity in the vacuum ultraviolet (VUV) (10 nm – 20 nm and 110 nm – 200 nm) are being planned. The details are given in the WG-UV report.

9.9 Guidelines for CCPR key comparison report preparation (draft 5)

The 5th draft of these guidelines was distributed to working group members on 10 October 2005 and discussed at the WG-KC meeting. The current content of these guidelines is, as follows:

1. Pre-draft A Process 1: Distribution of uncertainty budgets;
2. Pre-draft A Process 2: Review of relative data;
3. Identification of outliers;
4. Preparation and distribution of draft A;
5. Review of draft A by participants;
6. Preparation of draft B;
7. Publication of final report;
8. Recommended time line;
9. Appendix A: An example of relative data;
10. Appendix B: An example of a simple analysis of comparison data.

Dr Ohno reported that there had been general discussion by the WG-KC on the correlation between NMI scales, the use of a model, time-table (including in the protocol a deadline for results from participants), and linking results of bilateral comparisons to CCPR key comparisons. The consensus of the members was to not limit the calculation technique for the key comparison reference value to the simple analysis proposed in Appendix B. Based on these discussions, Dr Ohno, will propose changes to draft 5 and discussion will continue by e-mail. It is planned to finalize the first version of the Guidelines in early 2006.

The President asked if the WG-KC intends to address the linking of results of RMO comparisons. Dr Ohno said that there was insufficient time at the working group meeting to discuss this issue but some suggestions have been proposed by Dr Ikonen and would be further discussed by e-mail. He also mentioned that Dr Fox, as Chairman of the Task Group considering strategies for CCPR/RMO comparison, had given a report on how to handle this issue (see below). This preliminary report was largely the personal thoughts of the Task Group Chair but these ideas would be further developed with the full Task Group.

Dr Xu asked for clarification on whether the pilot laboratory of an RMO comparison can be a laboratory that had not participated in the CCPR key comparison. There was further discussion on this issue with input from several members but no conclusion was reached. The President said that one of the terms of reference of the WG-CMC is to advise the RMOs on what comparisons are required and that the issue of piloting RMO comparisons should be raised within the Task Group for strategies for CCPR/RMO comparisons, so that they can develop guidelines.

9.10 Discussions on bilateral and RMO comparison issues

Dr Fox, Chairman of the Technical Group on Strategies for CCPR/RMO comparisons, gave a report entitled "Early thoughts of Chair (not discussed with members)". The major issues, he raised were:

- Cost of comparisons is very expensive, particularly for the pilot laboratory;
- Time from initiation to end is long, particularly for CC key comparisons;
- Pilots of CC key comparison are often larger NMIs;
- CC key comparison must include representation of all RMOs – not to be biased to any RMO;
- Opportunity through bilaterals to correct "error";
- All NMIs must have opportunity to participate in at least an RMO comparison;
- RMO comparison must happen soon after completion of CC comparison.

Some ideas were proposed for addressing these issues:

- Cost of comparison (pilot laboratories) to be shared by participants;
- Limit number of participants for key comparisons to 6 to 8 (to reduce time and workload);
- Large RMOs to consider advantages of two co-pilots for comparisons to reduce timescales;
- Sharing of piloting responsibility within RMOs to smaller NMIs.

The WG-KC will continue discussing these recommendations with leadership of Dr Fox and the task group.

The WG-KC also discussed bilateral comparisons under CCPR or RMO auspices, where the distinction is not clear. The members studied the:

- *CIPM Guidelines for CIPM Key Comparisons* (1999-2003 revised) and the document;
- JCRB-14/6(3): Process for Subsequent Bilateral Key Comparisons.

The WG-KC agreed that only those bilateral comparisons that will correct errors in the measurement of the CCPR key comparisons already carried out will be designated CCPR bilateral comparisons. All other bilateral comparison (to align new NMIs to KCRV in past key comparisons) will be designated RMO bilateral comparisons.

The same numbering is used for supplementary comparisons (S1, S2,…) of different quantities by the CCPR and some RMOs, which is confusing. Considering that there will be no further CCPR supplementary comparisons, and that these RMO comparisons are already started, it was concluded to live with this inconsistency.

It was requested to clearly label *bilateral* key comparisons as such on the KCDB website, and the BIPM staff agreed to do this.

9.11 Discussion on periodicity of key comparisons

This item was not discussed due to lack of time in the working group meeting but is covered in section 15.1.

9.12 Discussion on data reduction for CCPR key comparisons

Two working group documents have been prepared by Dr Parr on this issue (CCPR/05-03 and -04). The main points of these documents were summarized by Dr Ohno. These are, as follows:

The results of comparisons do not come from the same population, thus cannot assume expectation value to be zero. The uncertainty budgets by participants are not conducted in a uniform manner and they are not sufficiently credible. These considerations do not support the use of weighted mean. Dr Parr advocates the use of the simple mean for KCRV calculation, but he respects the CCPR decision on the use of weighted mean with cut-off. He does not support extensive application of statistical methods as performed in the CCPR-K1.a comparison, and strongly recommends keeping the analysis in CCPR comparisons as simple as possible.

A response to these comments has been prepared by NPL and is registered as working document CCPR/05-13. Dr Ohno and Dr Fox agreed that this issue will be addressed in the Guidelines for CCPR Key Comparison Report Preparation.

9.13 Schedule of next meeting

An invitation was received from Dr Matamoros of CENAM, to hold the next meeting of the key comparison working group at CENAM, in Queretaro, Mexico during the last week of October 2006, in conjunction with a Metrology Symposium.

9.14 Proposal for new Chairman of WG-KC

The Chairman of the WG-KC, Dr Al Parr, has resigned from the chairmanship. The members of the working group have unanimously supported the motion to recommend to the full CCPR membership that Dr Ohno become the new Chairman of this working group.

10 LIAISON WITH CCT WORKING GROUP 5 ON “RADIATION THERMOMETRY”

Dr Fox reported on the activities of this very active working group in CCT. He has submitted to the CCPR a copy of the report from the outgoing Working Group 5 Chairman, Dr Fischer (CCPR/05-10*)*. The chairmanship of this working group has recently changed to Graham Machin of NPL. The working group has prepared a draft document on a Best Practice Guide for low temperature radiation thermometers in the infrared (IR) domain. Dr Fox had expected that Prof. Sapritsky would be attending the CCPR meeting and making a presentation on eutectics and plans to establish a new high-temperature thermodynamic scale based on these eutectics by 2011. The working group has made a request to the radiation community to carry out a pilot comparison to use radiometry based on filter radiometers to assign thermodynamic temperatures to these eutectics. The time frame for this comparison is 2005-2006. Because of the short lead-time for this comparison, only NMIs with mature capabilities in this field are expected to

participate in this comparison. These NMIs should make themselves known to the CCT Working Group 5 Chairman.

11 REPORTS BY RMO TC CHAIRS

11.1 APMP

The Report of the Asia/Pacific Metrology Programme (APMP) was given by Dr Xu. There are 11 members in this RMO and Dr Xu has been Chairman since 2003. The RMO has established working groups for CMCs and key comparisons. The WG-CMC has five members (KRISS, MSL, NIM, NMIJ and SPRING). The WG-KC has no fixed membership, but is formed by coordinators of the key and supplementary comparisons and chaired by the TC Chairman.

Dr Xu reported on the APMP photometry and radiometry activities including annual meetings, workshops, WG-CMC, WG-KC and other activities that are aimed at promoting technical exchange and collaboration among member NMIs and helping developing country economies setting up photometry and radiometry capabilities. Details were given on the status of:

- the APMP CMCs already published in KCDB, after the Round 1 and 2 inter RMO CMC review process;
- the intra RMO review process for the Round 3 CMCs;
- the inter RMO review process for SIM.PR.3.2005 and EUROMET.PR.3.2005.

Dr Xu reported that the following comparisons are finished or in progress:

- CCPR-K3.a.1, Luminous intensity. Participants are NMIA and SPRING. Measurements are completed and results have been published in *Metrologia*, 2005, **42**, Tech. Suppl. 02001.
- CCPR-K3.b.1, Luminous responsivity. Participants are NMIA and SPRING. Mesurement are completed and results have been published in *Metrologia*, 2005, **42**, Tech. Suppl. 02001.
- CCPR-K1.a.1, Spectral irradiance. Participants are NMIA and SPRING. Draft B report was submitted in June 2005; waiting for results of CCPR-K1.a.
- APMP.PR-S1, Irradiance responsivity of UV detectors. Participants are: SPRING (pilot), NML-CSIR, CMS-ITRI, KRISS, NIM, NMIA and NMIJ. Measurements are completed and draft A report is in preparation.

The following comparisons are planned:

- Fibre optic power responsivity;
- Luminous flux;
- Luminous intensity;
- Spectral diffuse reflectance;
- Spectral power responsivity;
- OTDR;
- LED CIE standard intensity, flux.

Dr Xu reported that these planned comparisons have not yet been registered with the BIPM. The first two (fibre optic power responsivity and luminous flux), have secured funding and only some have developed technical protocols; details were given for the technical protocol for the optical fibre power meter responsivity comparison.

Dr Xu concluded his report by outlining the focus of future APMP photometry and radiometry work. In particular, to carry out annual CMC submission and review, new APMP comparisons to underpin CMC claims and to hold an annual TCPR workshop on common topics of interest.

There were no comments to this report.

11.2 COOMET

No report was presented. The COOMET TC Chairman, Prof. Sapritsky, was not present and no representative was available at the meeting to give this report.

11.3 EUROMET

Dr Rastello reported on the activities of EUROMET PHORA, the photometry and radiometry technical committee. Their last meeting was in April 2005 and, at that time there were 29 active PHORA projects. The trend is for PHORA projects to start and complete their work within 12 month period. Annual reports are posted at the website PHORANET.

Dr Rastello reported that the following key comparisons are in progress:

- EUROMET.PR-K2.b, Spectral responsivity: The measurements are almost completed;
- EUROMET.PR-K3.a, Luminous intensity (pilot is PTB, according to protocol, to be completed in 2005);
- EUROMET.PR-K3.b.1, Luminous responsivity: Completed bilateral with the results available in *Metrologia*, 2005, **42**, Tech. Suppl. 02002;
- EUROMET.PR-K4, Luminous flux (according to protocol, to be completed in 2005);
- EUROMET.PR-K4.1, Luminous flux and luminous intensity; Bilateral between LNE-INM and INM-BRML: Measurements are completed and results are expected at the end of 2005;
- EUROMET.PR-K5, Spectral diffuse reflectance (pilot is OMH): Technical protocol to be sent in December 2005 with measurements starting in September 2006;
- EUROMET.PR-K6, Spectral regular transmittance (pilot is LNE): Measurements are completed and draft A is planned by the end of 2005.

The following key comparisons are planned:

- EUROMET.PR-K2.a.1 of spectral responsivity. Bilateral between NMi VSL and SP, and
- EUROMET.PR-K2.a.2 of spectral responsivity. Bilateral between JV and NMi VSL.

The following supplementary comparisons are in progress.

- EUROMET.PR-S1, Comparison of chromatic dispersion reference fibres: The measurements are completed and the draft B report is available;
- EUROMET.PR-S2, Radiant power of high power lasers: Started in 2004 and expected to be finished by December 2006.

Dr Rastello reported that the next challenge for EUROMET is iMERA and Article 169. iMERA is an EC "ERA-NET" coordination action that involves 20 partners from 14 countries. Formal partners include five ministries and JRC-IRMM. This EC action is for 3 years duration with a start date of 1 April 2005. Dr Rastello described the iMERA objectives and work programme. The objectives include sharing of facilities, dissemination of information and exchange of staff, joint activities, and governance. Dr Rastello reported that there has been considerable debate about what legal structure EUROMET should have in order to deal with Article 169 of the European Treaty. A EUROMET working group has been created to deal with this issue. Dr Rastello will chair the first meeting of this working group.

There were no comments to this report.

11.4 SADCMET

Ms van Tonder reported that NIS (Egypt) and the Kenya Bureau of Standards (KEBS) have established photometry and radiometry laboratories but no RMO comparisons have been carried out. She reported that CSIR-NML is an associate member of APMP and listed the APMP comparisons in which they have participated.

There were no comments to this report.

11.5 SIM

Report given by Dr Matamoros. There are only five active members in SIM: CENAM, INMETRO, INTI, NIST, and NRC, which is reason for lack of regional comparisons. Costa Rica is an emerging member and has begun some work in luminous flux. A photometry and radiometry contact in Costa Rica has not yet been established.

Dr Matamoros reported that the following comparisons are in progress:

- SIM.PR-K4, on luminous flux. Five laboratories are participating: CENAM (pilot laboratory), INMETRO, INTI, NIST and NRC. The protocol was approved in February 2005 and measurements are in progress.
- SIM.2.4, on spectral regular transmittance (not yet recorded in the KCDB). Measurements have been completed and the draft B report is in preparation.

The following comparisons are planned:

- Spectral responsivity to link to CCPR-K2.b;
- Luminous intensity;
- Spectral diffuse reflectance.

A SIM seminar is proposed for developing economies on photometry.

There were no comments to this report.

12 LIAISONS WITH OTHER ORGANIZATIONS

12.1 WMO

Dr Schmutz gave a report on the activities of World Meteorological Organization (WMO) relevant to the CCPR activities. He indicated that there are two main issues involving the working structure of WMO. The first of these is a new agreement on reciprocal representation on the BIPM and WMO. Dr Fox and Dr Schmutz are the two liaisons that represent CCPR on the expert team for radiation members. He suggested that we also need a representative from WMO at the CCPR.

The President asked if CCPR should write to WMO or work through the two liaisons, Dr Fox and Dr Schmutz. In response to this question, Dr Schmutz replied that CCPR should write to WMO and invite a representative to the CCPR meetings.

The second issue that Dr Schmutz highlighted was the WMO mandate to the World Radiation Centre at PMOD involving the dissemination of the World Radiometric Reference (WRR). He briefly described the results of the recent intercomparison of solar irradiance measurements that was held in Davos in October 2005 just prior to the Newrad2005 meeting. This comparison is carried out every 5 years and involves about 3 weeks of measurements. This year, there were 72 participants with 101 instruments from 41 countries.

Dr Schmutz said that they have compared their WRR scale of radiant power with the SI scale of METAS and of NPL. The results of this comparison showed that the WRR agreed with the SI within the uncertainties.

Dr Schmutz indicated that PMOD/WRC is a signatory of the CIPM MRA (through METAS) since 2003. PMOD/WRC has made a presentation of its Quality System to EUROMET and has participated in comparisons of radiant power. Their goal is to have their CMCs for solar irradiance included in the BIPM key comparison database. He said that, in the future, he hoped to be talking about solar irradiance as a CCPR rather than WMO comparison activity.

The President commended this partnership with the WMO and expressed his hope that this convergence between the WRR and SI units would continue.

12.2 CIE

Dr Bastie reported on the activities of the International Commission on Illumination (CIE) relevant to the activities of the CCPR from 2003 up to April 2005. He listed the following CIE publications:

- Joint ISO/CIE Standard ISO 23539:2005/CIE S010:2004 – The CIE System of Physical Photometry;
- Technical report CIE publication 151:2003 – Spectral weighting of solar UV radiation;
- Techncial report CIE publication 153:2003 – Report on intercomparison of measurement of luminous flux of high pressure sodium lamps;
- Techncial report CIE publication 15:2004 – Colorimetry, 3rd edition;
- Technical report CIE publication 165:2005 – 10 Degree Photopic Photometry Observer.

Dr Bastie briefly summarized the activities of the seven CIE Divisions, then listed the TCs of Divisions 1, 2 and 6, that are of CCPR interest. These are:

- Division 1: TCs 1-30, 1-37, 1-41, 1-46, 1-56, 1-59, 1-62, and 1-65;
- Division 2: TCs 2-25, 2-28, 2-29, 2-40, 2-43, 2-44, 2-46, 2-47, 2-48, 2-49, 2-56, 2-58, 2-59, and 2-60;
- Division 6: TCs 6-03, 6-23, 6-44, 6-46, 6-53, 6-54, and 6-55.

The following recent or upcoming CIE Symposia are related to CCPR activities:

- LED light sources, June 2004, in Tokyo;
- Light and health (Non-visual effects), 30 September – 2 October 2004, in Vienna;
- 75 years of the standard colorimetric observer, 16-17 May 2006, in Ottawa;
- Measurement Uncertainty Evaluation, 12-13 June 2006, at PTB.

The President asked if there should be a more formalized relationship between the CIPM and CIE. This has already been carried out, for example, with ILAC and WMO. He said that he had made this recommendation to the CIPM and it had been supported. The CIE has a very important relationship with the CCPR and mutual expectations need to be defined. He indicated that he has prepared a first draft of this agreement that would be considered by the CIPM. This is a framework agreement, largely based on the agreement between the CIPM and WMO. It is not intended as a detailed document of responsibilities but as a memorandum of understanding. He will be distributing a draft of this document to the CCPR members. He asked if the CCPR members were supportive of this initiative. General support was confirmed.

Dr Fox asked if someone would be willing to take over the function of reporting on CIE activities at CCPR meetings since Dr Bastie is retiring in the near future.

Dr Zwinkels volunteered to take on this function and this was accepted.

12.3 CORM

Dr Ohno reported on the mandate and current activities of the Council for Optical Radiation Measurements (CORM). CORM 2006 is being held at NIST, Gaithersburg, 9-11 May 2006, and the theme is “Industry and National Metrology Institutes Partners in Light Measurement Problem Solving”. This session will be followed by an Expert's Symposium on Light Measurement Techniques and Instrument Calibration Techniques and Uncertainties. Further information on this conference can be found at the CORM website: www.corm.org.

12.4 ORM

Dr Fox reported on the mandate and recent activities of the Optical Radiation Measurements (ORM) Club of the NPL. The formulation of this programme is through the UK Department of Industry. The NPL ORM Club hosts annual meetings and focussed interest groups (FIGs). There are currently about 200 individual and corporate members. ORM, in cooperation with CORM, will be co-hosting the Oxford V Conference on Spectrometry at NPL in June 2006. More information about this conference can be found at the NPL website: www.npl.co.uk.

12.5 UV Community

The President requested a report of UV Community recent activities from Prof. Metzdorf. There were no new activities to report.

13 MEMBERSHIP

The President gave a brief overview of the CCPR membership. There are currently 18 members with the following distribution: Europe (ten), Asia (six) and North America (two). There are three official CCPR Observers and two of these have applied for official CCPR status. Written applications have been received from SPRING, Singapore (CCPR/05-07) and from UME, Turkey (CCPR/05-11).

Dr Xu gave a summary report on the application from SPRING. SPRING has been an Observer for the past 6 years, a signatory to the Metre Convention in 1993 and a signatory to the MRA in 1999. The NMI was founded in 1975 and established an optical radiation laboratory in 1990 with five staff. He highlighted the technical progress made in developing photometric and radiometric measurement facilities, participation in comparisons and implementation of a quality system.

Dr Sametoglu gave a summary report on the application from UME, Turkey. Their laboratory was a signatory to the MRA in 1999. He described the progress the laboratory has made in developing photometric and radiometric scales, their current traceability chain, list of publications since 2003, and planned and completed comparisons.

Dr Fox asked if there were any guidelines for CC membership. The President said that there are basically the criteria that are set out in the document received from the CIPM (CCPR/05-12) and distributed to members the preceding day. One important criterion is active participation in RMO work.

There was some general discussion about the applications from SPRING and UME. CCPR members from both APMP and EUROMET strongly supported the applications of the laboratories in their regions and cited their strong leadership and activity in RMO work.

The application of SPRING was recommended unanimously to the CIPM for full CCPR membership.

The application of UME was recommended unanimously to the CIPM for full CCPR membership.

14 DISCUSSION ON THE EVOLUTION OF THE SI

The Executive Secretary gave a presentation on the evolution of the International System of Units, SI (CCPR/05-05). It is proposed to change the definitions of four base units: the kilogram, ampere, kelvin, and the mole. Professor Wallard stated that many CCs are concerned about what will be the impact on the user community if new SI definitions are made in 2011. He stressed that the CCs need to be very careful that the values selected are correct since the implications are far-reaching.

Dr Fox said that the CCPR does not have to do anything regarding the definition of the candela for 2011. However, further in the future, the CCPR should consider a quantum-based (e.g. photon) quantity. The President said that the CCs have been asked for their inputs on only the four proposed re-definitions. The recent trend has been to bring more chemical and biological areas into the SI. Thus the fields having an impact on the direction of the SI has increased beyond the traditional field of physics. The growing importance of "soft" metrology, defined as the measurement of parameters that correlate with attributes of human response, and the importance of the candela as the archetypical measurement parameter of this type, was stressed. This view received support from the meeting.

Dr Thomas said that in her role as Executive Secretary for CCU, if these four units are redefined, there will also be impacts on the second and the candela. She said that several members of CCU have recommended taking the candela out of the group of SI base units since it appears to be a derived unit. She does not personally subscribe to this view. The President said that the CCPR should leave most of this decision to the CCU. Professor Wallard said that, following up on Dr Fox's remark, we do not need to do something now but that a quantum-based candela may be a reality in the future. In 2007, we may be given advance warning of what will happen in 2011 or 2015. These issues should be considered in the CCPR Working Group on Strategic Planning (WG-SP, see section 15.3). There was considerable discussion regarding the prospect of redefining the candela using photon techniques and defending it as a base SI unit. The President said that the CIPM has accepted his recommendation that photobiological and photochemical units be included in the main text of the new SI brochure. Dr Ohno stressed that we should distinguish clearly between candela and photobiological quantities since their significance is very different.

Dr Thomas mentioned that the CCU requires the appendix on photobiological units to be translated into French. She said that the CCU also needs the section on photometry in Appendix 2 of this SI Brochure, related to the practical realization of the SI units, updated. It was last reviewed in 1996-97. The President said that the SI Brochure is to be published next year and asked for volunteers to review this Appendix. Five members volunteered: Prof. Metzdorf, Dr Bastie, Dr Ohno, Dr Fox, and Dr Hengstberger.

15 ANY OTHER BUSINESS

15.1 Comparison periodicity

Dr Stock prepared a table summarizing the replies to the questionnaire on key comparison periodicity (CCPR/05-06). Although there was no clear consensus, the majority of respondents favored a periodicity of about 10 years. The President asked if the WG-KC could now use these inputs and proceed with making a recommendation for comparison periodicity.

15.2 CIPM Consultative Committees general rules and policy

This Agenda item was discussed together with 15.3. The key outcomes of these discussions are reported under 15.3

15.3 Strategic Planning Working Group

The creation of a Strategic Planning Working Group was recommended by the CIPM at their recent meeting.

The President has drafted terms of reference for this working group, denoted WG-SP:

- make proposals on strategic directions in line with CIPM guidance document;
- advise CCPR on optimum structure;
- draft and maintain admission criteria for CCPR membership categories and for working group membership;
- monitor developments with respect to future of the SI.

There was a general consensus of the members that there is a need for such a working group. Professor Metzdorf felt that the second bullet should apply to the full CCPR membership. The President said that the working group would have the role of making proposals to the full CCPR membership who would have the final say. Professor Wallard said that the CCPR should be looking at strategic technical coverage such as future directions. The President asked the members if we should have separate strategic planning working groups for sources, detectors and materials, with task groups under this structure with limited lifetimes. He said that the CCPR could consider the CORM Reports as a model of strategic planning documents. Dr Ohno replied that the role of CCPR is directed more to carrying out comparisons and defining measurement units. He queried the need for new technical working groups in CCPR when a forum for these discussions was already taking place at CIE and other places. Dr Rastello said that WG-SP could benefit from considering EUROMET strategies. The President replied that there will be a parallel structure.

Dr Matveyev asked if it would be possible to create a sub-group within this working group to consider his submission for new CMC categories. The President assured Dr Matveyev that the request from VNIIM would receive due consideration and that Dr Fox had been tasked to liaise with the CCT and clarify where the VNIIM application for new CMC quantities should reside.

Organization of WG-SP:

Chairman: Dr Hengstberger

11 members: CSIR-NML, INRIM (formerly the IEN), LNE, METAS, MSL, NIST, NMi VSL, NMIJ, NPL, NRC and PTB.

The President proposed that the membership should also include the Chairmen of all working groups and representatives of all RMOs. Dr Fox recommended having a more stable structure for strategic planning purposes. The President feels that there needs to be some continuity in the membership. Professor Metzdorf proposed that Dr Hengstberger chairs this committee for the first year of operation. Professor Wallard said that CCEM had also followed this path in the creation of their WG-SP. He recommended keeping the committee small at this stage but making working documents available to the full CCPR. Dr Fox felt that the current membership list has a high European bias. Dr Xu asked if observers are to be included. The President replied that observers would not be included at this stage, but the group will need to look at achieving a balance. Dr Ballico recommended adding SPRING to the WG-SP membership subject to CIPM approval in October 2006. He suggested that the full membership should include RMO Chairs and have them select representatives from each of the regions, e.g. two from EUROMET, two from APMP, two from SIM, and one each from COOMET and SADCMET. Professor Wallard indicated that the CC working group chairmen are *ex-officio* members and expressed his view that strategic planning is not an RMO issue but a CCPR issue. Furthermore, the scope of the activity is very broad and a sufficient base of members is required to form the various task groups. He also suggested that NMIJ be added to the membership to provide regional balance. Dr Saito agreed to this suggestion. Dr Ohno mentioned that the WG-KC is also working on this issue of establishing criteria for working group membership and that active participation is essential as membership criteria. The President said that there should be self-elimination clauses and recommended that Dr Ballico consider this idea in preparing his draft proposal for membership criteria. Dr Fox asked about the inclusion of observers and the President replied that this issue could be addressed by the working group.

15.4 Event on metrology and climate change

Professor Wallard gave the background on this proposal. The suggestion of an event on metrology and climate change was first made to the CIPM in 2004 and reiterated this year. Professor Wallard was asked to speak with WMO about having such a workshop. It is planned to hold this event at the BIPM which can accommodate about 120 people. The President was concerned that the meeting may be too large for the BIPM facility. He asked if Prof. Wallard and Dr Schmutz (WMO) would be arranging this meeting. Dr Schmutz said that he would be happy if such a meeting would take place and he offers help to BIPM, in particular by doing the local organizing for a meeting in Davos, if CCPR wishes that meeting location. Professor Metzdorf said that a recommendation for such an event was made many years ago. Professor Wallard clarified that the recommendation made in 1999 was not for a workshop and noted that the CCQM holds many workshops in the area of food. There was a consensus that the BIPM should put forward the proposal to WMO to organize together a workshop, on “Metrology and Climate Change”. The President expressed his sentiment that the CCQM might also be involved in this workshop.

15.5 Documents on BIPM open website, organization of documents

It was decided that only the working documents CCPR/05-02 and CCPR/05-09 should be available on the open website, the other documents shall remain password protected.

It was recommended that the CCPR documents should not only be listed in chronological order, but classified according to categories.

16 REPORT TO THE CIPM AND RECOMMENDATIONS

Professor Wallard distributed to all members a draft document, dated 26 October 2005, regarding a recommendation to the CIPM on the importance of SI traceable measurements to monitor climate change. This Recommendation was based on his discussions with a few CCPR members. He requested that all CCPR members review this document and submit their comments within the next 14 days. He will then submit the final revised document for formal approval. Professor Metzdorf recommended looking at previous Recommendations made by CCPR to CIPM in 1999 and in 1994.

17 NEXT MEETING AND NEXT WG-CMC CHAIR

It was proposed to hold the next meetings of CCPR from 25-29 June 2007* but these dates needed to be confirmed. In particular, there was a concern about possible conflict with the dates of the CIE Quadrennial meetings in Beijing. If there is a conflict, the CCPR meeting dates would be adjusted by one week.

An invitation was received from Dr Matamoros to hold the working group meetings (WG-KC, WG-CMCs and WG-SP) at CENAM in the last week of October 2006. These meetings would be held in conjunction with a General Symposium on Metrology. There was some discussion about the proposed dates and number of days required for the working group meeting. Dr Fox proposed having the working groups meet prior to the Symposium. Dr Ohno said that he would check if any of the key comparisons or Task Groups wanted to meet at that time. Dr Ballico said that APMP generally meets at that time of year and there may be a conflict. Ms. van Tonder said the International Color Association (AIC) is also planning to meet in South Africa at about this time. The final decision on dates for the working group meetings was deferred until the dates of these other meetings was confirmed.

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* After the CCPR meeting, the date for the next CCPR meeting was changed to 18-22 June 2007 (to avoid being held directly before the CIE Quadrennial Session in Beijing).

18 CLOSING OF THE MEETING

Professor Metzdorf informed the attendees that this was his last CCPR meeting. The President thanked Prof. Metzdorf for his contributions on behalf of all the participants. Professor Metzdorf expressed his thanks to the members of the CCPR meeting and his hope that the advancement of science and metrology would continue to guide the future work of the committee. Dr Bastie had already announced his retirement before the next CCPR meeting during his report on the CIE activities. The President then asked if this was the last CCPR meeting for any other members. There were no other members who indicated that this was their last CCPR meeting.

The President thanked the participants for their contributions and closed the meeting.

Joanne Zwinkels, Rapporteur

Revised February 2006

RECOMMANDATION DU COMITÉ CONSULTATIF DE PHOTOMÉTRIE ET RADIOMÉTRIE PRÉSENTÉE AU COMITÉ INTERNATIONAL DES POIDS ET MESURES

RECOMMANDATION P 1 (2005) : Sur l'importance de mesures traçables au SI dans la surveillance des changements climatiques

Le Comité consultatif de photométrie et radiométrie (CCPR),

rappelant la Résolution 4 de la 21e Conférence générale des poids et mesures (1999), à propos de la nécessité d'utiliser les unités du SI dans les recherches sur les ressources terrestres, l'environnement, le bien-être humain et les études connexes ;

considérant

- l'importance croissante des mesures du rayonnement optique depuis le sol, l'air et l'espace, pour soutenir l'effort de recherche visant à mieux comprendre les causes et les conséquences des changements climatiques ;
- la collaboration déjà établie entre l'Organisation météorologique mondiale (OMM), le Bureau international des poids et mesures (BIPM) et le CCPR, à propos des besoins de l'OMM en matière de métrologie ;
- combien il est difficile de démontrer et de conserver la traçabilité au Système international d'unités (SI) dans l'espace, et que le niveau d'exactitude requis est souvent plus élevé que celui qui satisfait la demande industrielle courante ;
- le besoin spécifique que les expériences menées dans l'espace soient traçables aux unités du SI et combien il est difficile d'étalonner les instruments pendant la durée de la mission ;

encourage fortement les organisations appropriées à prendre les mesures nécessaires pour s'assurer que toutes les mesures susceptibles d'être utilisées pour les observations liées au climat sont pleinement traçables aux unités du SI ; et

recommande aussi aux organisations de financement appropriées de soutenir la mise en œuvre de techniques visant à mettre au point un ensemble d'instruments et d'étalons radiométriques traçables au SI, capables de réaliser une telle traçabilité dans l'espace.

RECOMMENDATION OF THE CONSULTATIVE COMMITTEE FOR PHOTOMETRY AND RADIOMETRY SUBMITTED TO THE INTERNATIONAL COMMITTEE FOR WEIGHTS AND MEASURES

RECOMMANDATION P 1 (2005) : On the importance of SI traceable measurements to monitor climate change

The Consultative Committee for Photometry and Radiometry (CCPR),

recalling Resolution 4 of the 21st General Conference on Weights and Measures (1999) concerning the need to use SI units in studies of Earth resources, the environment, human well-being and related issues,

considering

- the increasing importance of optical radiation based measurements from ground, air and space which support research into the understanding of the causes and impacts of climate change;
- the cooperation between the World Meteorological Organization (WMO), the International Bureau of Weights and Measures (BIPM) and the CCPR, relating to the metrological needs of the WMO;
- the difficulty of demonstrating and maintaining traceability to the International System of Units (SI) in the space environment and because the levels of accuracy needed are often more demanding than those needed to satisfy current industrial requirements;
- the particular need for space-based experiments to be traceable to SI units and the difficulty of obtaining a calibration during the operational phase of a mission;

strongly **recommends** relevant bodies to take steps to ensure that all measurements used to make observations which may be used for climate studies are made fully traceable to SI units;

and further **recommends** appropriate funding bodies to support the development of techniques which can make possible a set of SI-traceable radiometric standards and instruments to allow such traceability to be established in space.

APPENDIX P 1.
WORKING DOCUMENTS SUBMITTED TO THE CCPR AT ITS 18TH MEETING

Open working documents of the CCT can be obtained from the BIPM in their original version, or can be accessed on the BIPM website:

http://www.bipm.org/cc/AllowedDocuments.jsp?cc=CCPR

Document CCPR/	
05-01	CCPR. — Draft agenda for the 18th CCPR, 1 p. (restricted access)
05-02	CCPR. — Replies to the CCPR questionnaire, 135 pp.
05-03	NIST (United States). — The use of the weighted means in CCPR comparisons, A. Parr, 3 pp. (restricted access)
05-04	NIST (United States). — Comments on the use of the weighted mean in data analysis, A. Parr, 6 pp. (restricted access)
05-05	BIPM. — On possible changes of the SI system and possible consequences for the definition of the candela, M. Stock, 4 pp. (restricted access)
05-06	CCPR. — Replies to the questionnaire on the periodicity of key comparisons, 28 pp. (restricted access)
05-07	SPRING (Singapore). — Application of SPRING Singapore for full membership of the CCPR, G. Xu, 5 pp. (restricted access)
05-08	NPL (United Kingdom). — CCPR-K1.a, draft B-1, E. Woolliams, 396 pp. (restricted access)
05-09	CCPR. — Code of Procedure for CCPR Working Groups and Task Groups, 2 pp.
05-10	NPL (United Kingdom). — Report on liaison with CCT WG 5, N. Fox, 16 pp. (restricted access)
05-11	UME (Turkey). — Application of UME, Turkey, for full membership of the CCPR, S. Suer, 11 pp. (restricted access)
05-12	CIPM. — CIPM Consultative Committees: General Rules and Policy, 6 pp. (restricted access)
05-13	NPL (United Kingdom). — NPL's reply to Al Parr's "Comments on the use of weighted mean in data analysis", 6 pp. (restricted access)