Consultative Committee for Length – CCL

WORKING GROUP ON DIMENSIONAL METROLOGY – WGDM

8-9 June 2009 **Working Group Meeting No.14** BIPM HQ, Sèvres

Minutes of the 14th Meeting of the CCL-WGDM

Andrew Lewis, Rapporteur – 9 June 2009

The CCL's Working Group on Dimensional Metrology held its 14th meeting at the BIPM headquarters, Sèvres, on the 8 and 9 June 2009, convening at 09:05 on 8 June and closing at 17:35 on 9 June.

Executive:

Ruedi	**Thalmann**	METAS	(Switz.)	Chairman (TF1, TF2, TF3)	rudolf.thalmann@metas.ch
Attilio	**Sacconi**	INRIM	(Italy)	CCL President	a.sacconi@inrim.it
Raymond	**Felder**	BIPM	(Sèvres)	CCL Executive Secretary	rfelder@bipm.org
Andrew	**Wallard**	BIPM	(Sèvres)	BIPM Director	awallard@bipm.org

Rapporteur:

Andrew	**Lewis**	NPL	(UK)	Rapporteur (& DG1 gauge blocks)	andrew.lewis@npl.co.uk

RMO/JCRB Representatives:

Luis	**Mussio**	BIPM	(Sèvres)	JCRB	luis.mussio@bipm.org
Siew Leng	**Tan**	NMC/A*Star	(Singapore)	APMP	tan_siew_leng@nmc.a-star.edu.sg
Roman	**Fira**	SMU	(Slovakia)	COOMET	fira@smu.gov.sk
Michael	**Matus**	BEV	(Austria)	EURAMET (& DG11 MeP)	michael.matus@bev.gv.at
Oelof	**Kruger**	NMISA	(South Africa)	SADCMET (& DG3 angle)	oakruger@nmisa.org
José Carlos	**de Oliveira**	INMETRO	(Brazil)	SIM (& TF4 CMCs)	jcoliveira@inmetro.gov.br

DG Moderators & KC pilots:

Toshiyuki	**Takatsuji**	NMIJ	(Japan)	DG2 (expansion)	toshiyuki.takatsuji@aist.go.jp
Jack	**Stone**	NIST	(USA)	DG4 (diameter)	jack.stone@nist.gov
Emilio	**Prieto**	CEM	(Spain)	DG5 (step gauges)	eprieto@cem.mityc.es
Harald	**Bosse**	PTB	(Germany)	DG7 (Linescales)	harald.bosse@ptb.de
Andrew	**Baker**	NMIA	(Australia)	DG8 (surface texture)	andrew.baker@measurement.gov.au

Other workers:

Felicitas	**Arias**	BIPM	(Sèvres)	Delegate	farias@bipm.org
Alessandro	**Balsamo**	INRIM	(Italy)	Delegate	a.balsamo@inrim.it
Rob	**Bergmans**	NMi/VSL	(Netherlands)	Delegate	rbergmans@nmi.nl
Krishanan	**Chaudhary**	NPLI	(India)	Delegate	kpc@mail.nplindia.ernet.in
Ron	**Dixson**	NIST	(USA)	Delegate, DG-N moderator	ronald.dixson@nist.gov
Sitian	**Gao**	NIM	(China)	Delegate	gaost@nim.ac.cn
Walter	**Giardini**	NMIA	(Australia)	Delegate	walter.giardini@measurement.gov.au
Feng-Lei	**Hong**	NMIJ	(Japan)	Delegate	f.hong@aist.go.jp
Jae-Wan	**Kim**	KRISS	(Korea)	Delegate	jaewan@kriss.re.kr
Petr	**Kren**	CMI	(Czech Rep.)	Delegate	pkren@cmi.cz
Antti	**Lassila**	MIKES	(Finland)	Delegate	antti.lassila@mikes.fi
Janet	**Miles**	BIPM	(Sèvres)	Delegate	jmiles@bipm.org
Jim	**Pekelsky**	NRC	(Canada)	Delegate, DimVIM manager	jim.pekelsky@ nrc-cnrc.gc.ca
Gwo-Sheng	**Peng**	CMS	(Chinese Taipei)	Delegate	Gwo-Sheng.Peng@itri.org.tw
Lennart	**Robertsson**	BIPM	(Sèvres)	Delegate	LRoberts@bipm.org
Claudine	**Thomas**	BIPM	(Sèvres)	KCDB manager	cthomas@bipm.org
Georges	**Vailleau**	LNE	(France)	Delegate	georges.vailleau@lne.fr
Miguel	**Viliesid**	CENAM	(Mexico)	CCL-K6 (2D CMM)	mviliesi@cenam.mx
Tanfer	**Yandayan**	UME	(Turkey)	Delegetae	tanfer.yandayan@ume.tubitak.gov.tr

Apologies for absence: Dr Decker had sent apologies for absence. Dr Pekelsky was arriving later.

Day One, 8 June 2009

The meeting convened at 09:05.

0. Distribution of documents

Several documents had been distributed by Leonid Vitushkin and Ruedi Thalmann before the meeting via the WGDM area on the BIPM website and by email. Herein, these and other documents will be cited by the abbreviated form [09-xx] as listed in [09-02]. During the meeting several presentations were made and there was a request for **all presenters to forward copies of their reports (if not already sent or given) and any presentations, to the Chairman, for numbering and subsequent placement on the WGDM web site**.

1. Welcome

The chairman welcomed the meeting and made some remarks concerning transition form the current situation to a new format of the CCL working groups, under the new CCL President. Some recommendations made during the last WGDM meeting were yet to be discussed at, and agreed by, CCL. As such the WGDM was in a period of transition, however this meeting would follow the usual format for WGDM, awaiting decisions of the CCL over the next few days.

Professor Wallard welcomed the meeting. Dr Michael Kühne, the Deputy Director BIPM was attending the EURAMET General Assembly in Malta.

Dr Arias, head of Time, Frequency & Gravimetry section at BIPM, added the welcome from the staff of the former Length Section. She mentioned that it would be more useful to have the working documents available on the server, before the meeting.

Dr Sacconi, the CCL President, added his welcome. He asked that with the CCL working group's transition to the new structure, the efficiency and content of the previous working arrangements are not lost. He had asked for some draft documents from the previous week's CCL-CCTF to be distributed to WGDM.

2. Adoption of the agenda

The chairman tabled the agenda [09-01.3]. The agenda was adopted with no change. The Rapporteur was approved.

3. Minutes of the last meeting

3.1 Corrections to and approval of the minutes

The chairman had sent the last version of the approved minutes, written by Dr Meli, and they were sent to the delegates shortly after the last meeting. **The minutes were approved. The Rapporteur would issue them via the server.**

3.2 List of actions

The chairman polled the meeting for the latest situation on the progress of the Action items [A.1 to A.20] from the previous meeting.

No.	Action	Status
A.1	**All presenters** to forward copies of their reports (if not already sent) and any presentations made at the meeting, to **the Rapporteur**, for numbering and entry to the WGDM web site.	**OK**

A.2	**The chairman** to renumber and consistently re-title the documents before collecting together for the website, removing draft documents, and previous versions.	**OK**
A.3	**The chairman** to formally issue the approved minutes of the 2007 meeting.	**OK**
A.4	**Dr Vitushkin** to place the 2007 agreed minutes on the website.	**OK**
A.5	**Dr Pekelsky** to obtain the fs comb CMC information from the CCL-CCTF joint working group and create new entries in the DimVIM.	**To be discussed**
A.6	**Dr Lewis** to examine the document [07-41] after the JCRB had produced its online summary of the MRA processes.	**OK**
A.7	**The chairman** to identify those documents created by the WGDM that could be put on the open access part of the WGDM website.	**To be discussed**
A.8	**All participants** to send some input from the dimensional metrology community for the next CIPM meeting in November 2009 to Dr Sacconi regarding: the major challenges in the field of length and recommendations for activities and initiatives to be taken by the BIPM.	**OK**
A.9	**Dr Garnaes** to correct for a faulty length of an error bar in one of the diagrams of the report of Nano 5, as mentioned by Petr Kren.	**OK**
A.10	**Interested institutes** to inform George Orji until 24 October 2008 about their participation in Nano 6. G. Orji would appreciate also comments on how to handle the probe tip contribution in the comparison.	**OK – Still open for inputs. See Nano DG minutes.**
A.11	**Interested institutes** to contact Jim Pekelsky to participate in a comparison of nanoimprint standards. Collaborators in the pilot team are welcomed.	**OK - PTB have made some measurements**
A.12	**Dr Giardini** to confirm the DG8 “surface texture” moderator (Andrew Baker).	**OK**
A.13	**The chairman** to report to CCL on the proposed structure of DGs, TFs and seek approval for the new working groups WGs and WGn.	**During meeting**
A.14	**Dr Prieto** to send the results of EURAMET.L-K5 as draft A to the participants.	**OK**
A.15	**Dr Viliesid** to submit the DoE for CCL-K6 to the KCDB and to decide upon publication of pair wise equivalence with the KCDB manager Claudine Thomas.	**OK**
A.16	**Dr Wilkening** to ask Dr Jusko for sending the EUROMET.L-K6 results as draft A to the participants.	**OK**
A.17	**The Chairman** to complete the joint paper on comparison scheme.	**[OK]**
A.18	**Dr Viliesid** to prepare the technical protocol for the next CCL-K1.2009.	**OK**
A.19	**The Chairman** to propose Leonid Vituskin to place all the KC executive reports onto the restricted area on the web BIPM web site.	**OK**
A.20	**Dr Kruger** to prepare the Executive Report on the CCL-K3 comparison and send it to the Chairman for distribution.	**OK**

Dr Thomas noted that NANO6 is not yet registered in the KCDB. **The pilot needed to send a registration form**. The pending actions will be listed together with the actions of this meeting at the end of the minutes. Dr Sacconi asked for the **documents to be sent in advance of the next meeting**, at least by one week, to allow for study.

4. DG and KC reports

4.1 APMP

Siew Leng Tan presented the report [09-25] for APMP. In the last year, three key comparisons were completed and four were either running or at the draft report stage. There was no change to the status of two supplementary comparisons and two other comparisons (multi-lateral or bi-lateral). A gear comparison and a laser frequency comparison were in planning. Line scales, optical flats and glass hemisphere comparisons were being discussed. Eight sets of CMCs had so far been reviewed and published – APMP thanked the other RMOs for their help during the inter-RMO review. One set of CMCs was about to be submitted and six CMC sets were planned for the future. The TC-L meeting this year would be in December in Malaysia. See website:

www.apmpweb.org (u: TCLmember, p: TCLmember)

The chairman remarked that this report on APMP comparisons highlighted the need to agree on consistent numbering of key comparisons. This would be discussed at agenda item 6.4. Dr Sacconi asked if some of the 'other comparisons' in APMP and other regions (e.g. the optical flats comparison in EURAMET) may better be labelled as RMO Supplementary Comparisons. This would depend on the intention – cooperation in research or support of the MRA. In the latter case, the status as supplementary comparison would be better, but supplementary comparison guidelines should be followed in this case. [Dr Bosse responded later to this item, by stating that the EURAMET flatness comparison was a 'cooperation in research' project (not for MRA purpose) and the EURAMET gear comparison was being performed by laboratories which are not NMIs (Y12 in the USA and Newcastle University in the UK) so it could probably not be registered as a supplementary comparison].

4.2 COOMET

Roman Fira presented the report [09-26] for the COOMET region. There was a new chairperson of the TC-L - Dr. Vladimir Kupko. Four new projects were being prepared. The 2008 TC-L meeting had not taken place due to unavailability of sufficient members. The next meeting is being planned to take place in Russia in 2009. Several COOMET members have taken part in the EURAMET linescale comparison. The chairman asked if the report could identify the KCDB numbers for any comparisons performed under the MRA. **Dr Fira agreed to edit future reports to refer to KCDB numbering of comparisons.**

4.3 EURAMET

Michael Matus gave the report [09-27] for EURAMET. All CCL key comparisons now have at least one or more comparisons aligned with the CCL counterparts. Two had started or reached the reporting stage in the last year. A new step height standard comparison had started as well as a comparison on angle measurements using an autocollimator artefact. CMC submission number 7 had entered the KCDB, including CMCs from a non-EURAMET NMI (NIS Egypt). The next set of CMCs may also include CMCs from the Israeli NMI (which were previously delayed due to Quality System questions).

All the information is available on the main EURAMET website, www.euramet.org. The guest area of the TC-L website (u: TCL-guest p:helmholtz) is available at http://www.euramet.org/index.php?id=tc-l.

A new funding process under the European Metrology Research Programme had just opened a call on the subject of Energy. TC-L already has four running Joint Research Projects from a previous call. Three of the CCL-K11 pilot laboratories are in EURAMET. Other laser comparison projects have now ceased and all of the coordination work is now covered in EURAMET project 1064.

4.4 SADCMET

Oelof Kruger gave the report [09-28] on behalf of AFRIMETS. Four sub-regional RMOs had been joined into one, AFRIMETS. Some RMO functions up to now had not been performed by SADCMET. An EU-funded project was assisting in setting up various structures associated with MRA activities. The first AFRIMETS meeting would take place in Pretoria in July 2009. Mr Kruger was, therefore, representing both SADCMET and AFRIMETS.

4.5 SIM

José Carlos de Oliveira presented the SIM report [09-29]. SIM is running three gauge block comparisons, one by interferometry, one focusing on the phase correction measurement and one by mechanical comparison. SIM NMIs were participating in six out-of-region comparisons, one bi-regional comparison and five RMO comparisons. The SIM participation in CCL-K11 will take place at NRC using their frequency comb. SIM had reviewed two CMC sets from other regions. The SIM QSTF had approved quality systems related to CMCs from INMETRO and DICTUC (Chile). Dr Mussio remarked that since the last week, Peru became an Associate of the CGPM.

Dr Thomas remarked that the SIM-EURAMET.L-K8 comparison **is not registered in the database**. It is not recommended to register it as a bi-RMO comparison.

5. DG and KC reports

5.1 DG1, gauge blocks

Andrew Lewis had nothing to report from the gauge block discussion group. Current work was in the regions which were running comparisons.

Dr Viliesid spoke about the proposed protocol for CCL-K1.2009, which now covers the topics previously split into comparisons K1 and K2 (short and long gauge blocks, respectively). NRC was acting as co-pilot to assist with the long gauge blocks as CENAM did not have facilities for high accuracy measurements of these standards. The protocol proposed steel and ceramic short gauges, with the long gauge blocks returned to NRC, rather than CENAM. Dr Viliesid raised questions about the separate delivery of the two sizes of gauge blocks. The chairman responded that a possible solution would be to limit CCL participation to NMIs which can measure all sizes (short and long) – ideally around only ten participants.

Dr Prieto asked if the nominal sizes could be chosen to be the same as those used in previous comparisons, to minimize the linking uncertainty. Dr Lewis was concerned about the availability of suitable gauges with long history. Dr Viliesid added the necessity to include enough short gauges to allow the phase correction to be determined and Dr Lewis suggested adding another small gauge in case one of the others used in the phase stack became damaged. Dr Thomas mentioned that several K1 comparisons are already in the KCDB, so far with no numerical linking. The chairman confirmed that the first round of comparisons is completed and the linking has not been performed, at least not yet. K2 was no longer to be operated as a separate comparison. The chairman responded to a question from Dr Giardini on linking, by answering that CCL-K1.2009 would be a classical-style CCL key comparison, and not one of the new style CCL-RMO comparisons.

Dr Viliesid wished to delay the start of the comparison as SIM was already in the middle of a similar comparison. It would be necessary for the regions to organize their own local comparison to link to this one. It is the responsibility of the RMOs to nominate a limited number of participants in this CCL-K1.2009 comparison. Dr Balsamo suggested a possible re-numbering scheme – this would be discussed under agenda item 6.4. Dr Arias and Dr Thomas reminded the meeting that **the comparison needs to be registered** and that the **CCL has to formally approve the protocol**. For this comparison, the WGDM could present this request at the CCL meeting on the subsequent days. For future proposals, the submission to CCL can be via email to the Executive Secretary, for email discussion and decision by the CCL.

The chairman asked the meeting to agree on the technical basis of the protocol: **restriction of the number of participants** (approximately 10), **6 or 7 short gauge blocks in both materials**, **three long gauge blocks**. The **RMOs are invited to nominate NMIs to participate** and to inform the pilots, via their TC-L chairpersons, by 15 September 2009. These participants must be CCL members. Examining the current membership of CCL suggested that the participation should be anticipated from 3 EURAMET, 3 APMP, 1 COOMET, 2 SIM, and 1 AFRIMET NMIs. **No objections were raised.**

5.2 DG2, thermal expansion

Toshiuki Takatsuji presented the report [09-32] on this topic. The previous comparison had been conducted as a supplementary comparison and this was reported in the KCDB. Not so many NMIs supply calibration services for traceability. No requests had been received to perform more comparisons. Dr Takatsuji suggested suspension of the DG activity until there is interest in any new comparison. NMIJ offered bi-lateral comparisons with any interested NMIs.

Dr Matus noticed that several NMIs have thermal expansivity mentioned under the End Standards CMC category list. The **Dim VIM should be checked** that there are separate categories and **laboratories should be certain that their services are correctly listed**.

Dr Lewis mentioned that one of the largest uncertainty sources in dimensional metrology was thermal expansion and he wondered if the strategic planning discussions ought to consider this as a **possible research topic** for the future.

Dr Sacconi suggested this was an ideal subject to move out of WGDM and into a separate discussion group. He encouraged better inter-RMO discussion of such topics.

5.3 DG3, angle

Oelof Kruger reported on angle comparisons. CCL-K3 had been published and he was considering submitting a Metrologia paper. APMP K3 measurements are completed and the draft A report is ready. Future discussions will include linking to CCL-K3. EURAMET was about to start the autocollimator comparison – **Dr Thomas requested the pilot to register this comparison with the KCDB**. Mr Kruger mentioned the issue that both the CCL-K3 and APMP comparisons had shown issues with their 5 minute angle blocks – perhaps this ought to be investigated further. However, the APMP report was not yet public and discussion should wait until then. The next round of the K3 comparisons is not yet necessary and discussion can start at the next meeting.

Dr Bosse updated the meeting on the planned EURAMET comparison on an autocollimator. Two circulation groups were planned. The protocol had been amended very little since the previous draft and some suggestions had been received regarding the reporting methodology.

The two planned loops were to run Oct 2009 to Apr 2010 for the first group of NPL, LNE, MIKES, METAS, VSL, PTB. Then the second loop would run May 2010 to Dec 2010 for SMD, MKEH, GUM, CMI, IPQ, EIM, INPL, PTB. Each NMI would have a four week time schedule. NMIs will be emailed and asked to approve the timescale. EURAMET NMIs which had not fully responded to the pilot were excluded from the planning. However, Dr Prieto mentioned that CEM was interested and wondered if the emails had not been received. **Any NMI wishing to take part and not yet listed, should contact Dr Bosse directly.**

NMIJ had asked to join and the **pilot welcomed one or two additional participants from outside EURAMET.** Dr Takatsuji asked about how inter-RMO participation would be organized. The chairman responded that this was a EURAMET comparison, but in this case in particular, there was space for non-EURAMET participation. It was not a CCL-RMO comparison, just an RMO comparison which was open to additional participation.

Ms The chairman responded that this is correct for CCL-RMO comparisons, but in this case, this was an RMO comparison which was then, at the end of planning, opened to one or two additional participants. Dr Takatsuji asked how to distinguish these different comparisons from their names. This was not yet possible. The information was available from the minutes and WGDM papers, however it is not easy to find the information. This should be discussed at agenda item 6.4. [Dr Pekelsky arrived].

5.4 DG4, cylindrical diameter standards

Jack Stone mentioned that there was nothing to add, following the reports from the RMOs which had already described the various RMO comparisons.

5.5 DG5, step gauges

Emilio Prieto reported that APMP and EURAMET had proceeded to produce draft A reports on their comparisons. METAS could not confirm receipt of the draft A report from APMP.L-K5 (METAS was a participant). Dr Giardini mentioned that it was useful when sending documents to request a receipt of confirmation. It was later confirmed by Ms Tan that METAS was somehow being left out in the email circulation. Ms Tan has forwarded a copy of the Draft A to Dr Thalmann during the meeting.

Dr Thomas mentioned that in other CCs, when a key comparison report for a regional comparison is ready, it is accompanied by information on the linking to the relevant CCL key comparison. She asked where this was performed in CCL/WGDM. The chairman responded that this would be done once the reports were at least in draft B stage and that the linking task force would take care of it together with the pilots. Dr Thomas was happy to receive this information from the task force, for entry into the KCDB.

Dr Bosse commented that PTB was not a participant in the APMP.L-K5 comparison. **This needed to be corrected in the KCDB and in the KC planning document [09-23].**

5.6 DG7, line scales

Harald Bosse reported [09-36] on the recently concluded EURAMET linescale comparison, run by MIRS. Seven participants had been contacted due to anomalous results. APMP was preparing a 500 mm linescale comparison. He asked if participation was open to non-APMP participants. This was not yet decided. The chairman **suggested to be certain that there was enough linking** between the EURAMET and APMP comparisons by mutual participation. EURAMET had split the comparison into two loops due to the large number of participants, but had ensured mutual participation in both loops to provide the linkage.

5.7 DG8, surface texture

Andrew Baker presented his report [09-37]. He had surveyed available instrumentation and techniques for surface metrology. Most comparisons at the moment were in 2D profile measurements. There were no international comparisons in areal surface texture. Two key comparisons are currently active in this field, APMP.L-K8 (started July 2008, running to April 2010) and SIM-EURAMET.L-K8 (started May 2009, running until September 2010). Carnet problems had been encountered. The two comparisons were linked by mutual participation of NPL, NST and NIS (Egypt). Both comparisons featured softgauges. Not all laboratories had CMCs in all parameters.

At the moment, surface texture R&D efforts were in the areas of softgauges and areal parameter measurement. He asked for anyone with R&D activities to contact him with information on what is being pursued, especially in the areas of microscopes and optical profilers. Dr Baker was on secondment at NPL for three months so was more aware of the NPL equipment, but welcomed discussions with other NMIs especially regarding manufacture of suitable 3D artefacts. He presented some outline details of proposed areal artefact standards. The ISO standards in this area are well known and standard ASME B46.1 is nearing publication.

The chairman thanked Dr Baker for his detailed report. Several items raised in the report could be discussed in the strategic planning session.

The meeting broke for lunch at 13:15 and resumed at 14:15.

The chairman returned to the APMP.L-K8 / SIM-EURAMET.L-K8 comparison slide shown previously. He asked **to rename the SIM-EURAMET comparison as EURAMET.L-K8** (EURAMET participants being the most numerous) in order to be registered on the KCDB. The participants of both comparisons were confirmed as being NMIs or DIs of the Metre Convention.

5.8 DG11, *mise en pratique* lasers and fs combs

The chairman reminded the meeting that the responsibility for CCL-K11 is split between two committees – CCL-CCTF FSWG is responsible for technical issues and WGDM is responsible for

MRA issues. Michael Matus presented the report [09-38]. The latest protocol is available from the KCDB. Only the standards of the highest metrological quality falling under categories of 1.1.1 and 1.1.2 of the DimVIM are to be compared. This will be a blind measurement. The KCRV is the frequency of the participating laser standard as measured by the node laboratory – it will vary from one participant to another. The participation of NMIs offering the service based only on fs combs shall be discussed in the CCL meeting. Node laboratories call for participants in regional K11 comparisons, e.g. at yearly TC-L meetings, or potential participants can contact the pilot laboratory. Node laboratories should also validate their own combs. The question of whether non-CCL laboratories can take part is unclear. MIKES has issued a call and 7 EURAMET NMIs have expressed a desire to participate in the near future.

The chairman queried if this comparison was to support CMCs or was to provide equivalence of national standards. Prof Wallard responded that key comparisons can be used both as technical validation for CMC claims and to test equivalence of national standards. As such, this comparison was clearly a key comparison, and not a supplementary comparison. There was discussion concerning questions brought from the CCL-CCTF-FSWG meeting of the previous week.

Dr Hong was concerned at not introducing additional uncertainties to their measurements by some form of linkage. He thought that participation at any node's comparison was sufficient and the nodes were considered equivalent. He mentioned that the WGFS had set up a working group discussing the issues of comb validation.

Dr Pekelsky asked to bring forwards for immediate discussion an item tabled under agenda 6.5. Dr Madej had commented to Dr Pekelsky that the comb systems do not calibrate combs, they calibrate lasers. There was no intention to calibrate combs and no intention to submit CMCs for the calibration of combs. Therefore the classification categories under 1.1.1 and 1.1.2 were sufficient. However, there are other parameters of these lasers that are calibrated and it may be useful to add these parameters to the list of instruments or artefacts under 1.1.1 and 1.1.2, e.g. to add frequency stability and linewidth. Dr Sacconi welcomed the changes to the DimVIM categories, including removal of reference to the 'MeP' which was now replaced by the common list of frequencies.

Dr Stone raised the issue of calibration of transfer standards. Dr Pekelsky likened these to the calibration of gauge blocks that were transfer standards. However Dr Stone did not think the CCL-K11 protocol was suitable for these types of measurement. He wanted to measure his own laser against a NIST comb, take the laser to NRC, calibrate it, return the laser and in the interim, calibrate a client laser. Dr Matus agreed that this was not outside the protocol for CCL-K11.

Dr Thomas commented that the change of KCDB categories is not possible as this prevents the database from working. Any changes to the categories should respect existing CMCs. Any changes to 1.1.1 and 1.1.2 may also be necessary for other categories, e.g. spectral lamps. The DimVIM should be examined in more detail, and WGFS be asked for comments.

Dr Sacconi suggested that **the WGDM could ask the CCL** if it was feasible to use the expertise of the BIPM headquarters ex-length section staff to assist in a transition period. Prof Wallard responded that the CIPM decision to close the BIPM length section was concluded but they had asked for certain facilities to remain available for specific requirements. However, Prof Wallard could not make any specific promise as to availability. The node laboratory pilots present at the meeting welcomed any offer that could be made in this respect. The meeting was polled for the availability of 'travelling' combs. NPL has one, BIPM headquarters has one, BEV's is transportable.

The chairman summarised the conclusions of these discussions.

(1) The CCL-K11 protocol is OK for the calibration of stabilised lasers, such as classical MeP lasers,

(2) Any NMI from a Member State can participate in its local node laboratory measurements (even if they are not CCL members). Associate members would take part under special arrangements and be reported as such. The title of the comparison (CCL-K11) should not prevent this.

(3) The existing CMC category list is sufficient for the CMCs that will be submitted for laser calibration, including calibration using fs-combs, except that the specific wording needs editing, replacing, e.g. replace 'MeP' with the new terminology 'Frequency used for the realisation of the definition of the metre and the second' . Additional parameters should also be added to the 1.1.1 and 1.1.2 categories, but these terms to be suggested by the WGFS.

(4) Calibration of combs should be a separate topic of comparison and a separate classification in the DimVIM and probably not a subject for WGDM discussion. Such a comparison may use a recommended radiation which is known at a high level of accuracy. That would be the best available test.

(5) Node laboratories should check their own lasers. This would be assumed to be happening as part of their own internal quality system activities and a separate activity should not be necessary, e.g. as a blind comparison.

6. MRA: JCRB and Task Force reports

6.1 Report on JCRB activities

Luis Mussio, the JCRB Executive Secretary, presented his report [09-20]. BIPM members now numbered 53, and Associates to the CGPM were now 25. 48 Member states were MRA signatories. By JCRB meeting 20, the work on consolidating CIPM MRA documents was nearly concluded. JCRB meeting 21 had noticed that some CMCs on the KCDB have strange traceability claims. JCRB had recommended to CIPM several guides and documents on the running of the MRA, including CIPM MRA-D-05 which was a consolidation of all the JCRB documents on the MRA processes. The uncertainty of BIPM services are now presented on the website, for use by those NMIs that took traceability from BIPM services. The JCRB will send a summary of news shortly after each meeting to the RMO representatives.

The recent JCRB statement regarding re-reviewing of CMCs every five years had been misinterpreted. ILAC had requested extension of CMC lists to include categories of low level services not offered as CMCs by the NMIs. ILAC was to submit details of the additions that were needed.

The chairman suggested the technical discussions on uncertainties, traceability, etc be referred to the later agenda point. He asked how the information from the JCRB could reach the people concerned with implementing it. This was via the RMO representatives who were sent the information directly, with request to forward to TC-Chairs. The chairman welcomed the presence of Dr Thomas and Dr Mussio at the WGDM meetings to remind us of the items that were otherwise neglected. Dr Thomas added that some of the other CCs have a specific Working Group to address only MRA issues and they would receive this information directly. Dr Sacconi asked if it was possible to extract a summary of important points from this information and to distribute it more widely. The chairman asked for better availability of the JCRB documents – Dr Mussio pointed out that the documents from the JCRB become MRA documents and are then stored in the MRA area on the website.

Dr Stone asked about recognition for special services that were not included in Appendix C. Prof Wallard responded that if they were not CMCs, they could not bear the MRA logo, and could not be supplied to other NMIs that then use them as the basis for traceability.

Dr Yandayan asked about some terminology used in the presentation. Prof Wallard responded that the terminology had recently been clarified by legal advisors. A summary document had been prepared and he hoped this could be made more widely available.

6.2 Report of TF1: key comparison linking

Jennifer Decker was unable to attend and had asked Dr Bosse to present the report [09-21]. The report summarised proposed terms of reference for this taskforce. The objectives were to provide sound scientific evidence that calibration capabilities in national metrology institutes are equivalent, thereby supporting the CIPM Mutual Recognition Arrangement (MRA); to perform linking via rigorous mathematical and statistical procedures for the links and evaluation of statistical consistency; and to

ensure that the linking formalism should be straightforward and published in widely-available literature so that anyone can perform linking comparisons in order to demonstrate equivalence between labs at any time, including a third party.

Discussion points currently occupying the taskforce were:

- Which comparison should be chosen as primary, for each linking process;
- Linking based on difference of mean values (either KCRV or a 'mean value of linking NMIs' for each comparison) has the weakness that it assumes that NMIs can measure the same value – the very hypothesis that KCs aim to test (circular argument) – the mean of the differences should be a better parameter;
- The value of a KCRV should not be changed by subsequent measurements, therefore a 'distributed' parameter should not be added to the CIPM KCRV;
- Uncertainties as a result of linking are not used to determine CMC listings which is achieved in the main comparison loop; nevertheless, labs wishing closer bilateral linking could perform a bilateral comparison.

Dr Viliesid was concerned with the issue of calculating the uncertainty of the linking parameter based on the weighted mean of the uncertainty claims of the participants, as he was not certain how accurate the expressed uncertainties were in practice. The chairman welcomed any proposed linking method that was fast and transparent. If the workload associated with linking just one or two gauge block results was too great, then it may be too much to link the more detailed comparisons such as surface texture or ball plates. Dr Bosse responded that the calculation for the K1 comparisons is quite simple and is merely postponed until after approval of the process by CCL. The analysis of more detailed parameters requires further discussion of the initial analysis technique for data reduction.

Dr Thomas said that the KCDB manager should not be listed as a member of this task force. The publication of bilateral degrees of equivalence in the KCDB is becoming less frequently requested. Publication of such large tables of data takes much time for preparation and checking.

Dr Giardini requested further discussion of the underlying statistical assumptions as one of the proposed schemes would result in the increase of the uncertainty in the regional comparisons.

The chairman asked if Dr Brown was still a member of this group – he had been removed following email discussions. Dr Arias reminded the meeting that this grouping may not exist after the next CCL meeting. The chairman hoped that this group would continue to exist, perhaps as part of an MRA working group of the CCL, so it was still useful to agree on the proposed terms of reference. Dr Pekelsky was concerned that the proposed deliverables for KCs in general (i.e. pair-wise degrees equivalence) did not address the simple concern of clients of whether or not an NMI met its CMC uncertainty claim. Dr Thomas cautioned against the use of the term 'primary'. The chairman **asked the Taskforce to revise the wording to use standard terms from the MRA** but also to take into account the forthcoming decisions of the CCL on restructuring.

6.3 Report of TF2: joint paper

Ruedi Thalmann reminded the meeting of the small group working on this paper, which had been required to address concerns expressed to the WGDM at the Querétaro meeting. The chairman had recently updated the document [09-22] and he presented it. After presentation, he opened discussions. Dr Pekelsky reminded the meeting of the perceived benefits of the CCL-RMO comparison scheme as it was originally planned, namely to reduce the workload of the CCL members which were linking laboratories. However, recent discussions had shown the necessity to link via common participation and this was looking increasingly like the 'classical' scheme of CCL and RMO comparisons. Was it worth continuing the CCL special process or reverting to the classical scheme?

The chairman responded that there was still one economy of the new scheme in that the CCL comparison was not being run – this was one fewer comparison to be organised and one fewer set of

artefacts to be found and circulated. Dr Prieto added there was an advantage in that the new scheme operated comparisons that were available more frequently than the classical scheme.

Dr Giardini responded that the issue of the linking process was key to the organisation of the comparisons as the decision on the linking mechanism could affect the choice of comparison scheme.

Dr Sacconi reminded the meeting that it was the analysis of comparison CCL-K1 that prompted the operation of the new style of comparisons. And yet the second round of this same comparison was now to be operated once again using the 'classical' scheme and not the new CCL-RMO scheme.

Dr Balsamo asked what the rationale was for the document which was prepared by this taskforce. The chairman responded that the original intent was to justify to the CIPM the operation of the new scheme of comparisons. It may be needed if this new style of comparisons is to continue.

Dr Thomas asked if the 6 laboratories in the overlapping region of the presented chart could be viewed as a virtual CCL comparison. This could be the case where there was sufficient overlapping, i.e. enough laboratories. **The chairman would add this to the document and correct an error for Lab1 in the diagram, and add the point raised by Dr Prieto concerning better frequency of comparisons**. Until sufficient comparisons in both 'classical' and CCL-RMO format had been numerically linked and the linking process studied, it was too soon to abandon the new style of comparisons. The option to run either CCL or CCL-RMO comparisons was a useful choice to have available.

Meeting adjourned at 18:15

--- END OF DAY ONE ---

Day Two, 9 June 2009

Meeting re-convened at 09:05.

The chairman started the meeting by stating that at the end of the meeting there would be a summary of actions and items decided, prepared during the meeting by the Rapporteur. He asked the meeting to agree that the CMC categories 1.1.1 and 1.1.2 be left unedited at the present time, until the new 'single list of frequencies' had been fully prepared, titled, and was ready to be referenced. There were no objections.

The chairman had modified today's agenda to remove item 7.6 as these discussions would better fit within later agenda items discussing possible restructuring. The nanometrology discussions would be shortened as well as the agenda item on strategic planning.

6.4 Report of TF3: key comparisons

Ruedi Thalmann presented the Excel tables showing previous and current key comparison participation of CCL members. Dr Prieto asked for the list to be updated as CEM had recently become a CCL member. The chairman examined the schedule of previous comparisons and noted that none of the CCL comparisons needed to be re-run at the present time. The first round of comparisons were either completed recently enough and the next cycle for each comparison was not yet necessary, or comparisons were already in progress. **The chairman would put the updated comparison planning file on the server.**

The chairman had added a table on the comparison numbering scheme. He suggested that the format to be used should be

RMO.L-K3.1.2009

RMO or CCL refers to the region or the CCL comparison

L refers to Length metrology

K3 refers to the topic

.1 refers to a follow up comparison.

.2009 refers to a date, to distinguish different comparisons in the same topic.

The question of which date to use (start, or end), was discussed. The KCDB registers the comparison early in the process so it would be easiest to use the date of registration. Dr Thomas suggested that it may help to put the protocol document (as PDF file) in the KCDB at the time of registration (or as soon as the protocol is ready) – the chairman welcomed this offer. **The chairman asked all pilots of comparisons in the planning or running stage to send a PDF copy of the protocol document, to Dr Thomas, to be put into the KCDB**.

Dr Thomas suggested to keep the identifier complete in all documentation but not to update previous comparisons as they were to be left as they are.

There was discussion of the case of new comparisons where the measurands or artefact were different from the first cycle, for example the autocollimator in EURAMET.L-K3.a.2009, was it worth using the 'a' to identify the new artefact? The consensus was that this was too much detail, and the 'a' should not be used.

Dr Baker suggested adding text to each column in the spreadsheet to indicate the date of completion of the comparison. The chairman and Dr Pekelsky modified this suggestion to put this information in the Legend in the left column. Dr Pekelsky suggested moving the individual NMI cell to the actual year of measurement, as the date of measurement was the most important to the NMI. Numbering of cells

was also useful for monochrome printing. **The chairman would request the eventual key comparison planning taskforce to update the document as necessary.**

Dr Sacconi mentioned a EURAMET initiative for managing projects, including comparisons projects in order to achieve a better timescale. EURAMET would be suggesting adopting this to the other RMOs. The chairman welcomed this initiative and hoped that the process, especially regarding the transmission of the comparison results to the pilot in a timely fashion, would help keep comparisons on schedule. Dr Yandayan agreed that it was important to set more strict rules as this tested not only the technical competence of the NMI, but also the quality system.

6.5 Report of TF4: CMCs

José Carlos de Oliveira presented his report [09-24]. He had contacted a range of persons to comment on the possible terms of reference for the CMC taskforce. He had collected these responses into a draft Terms of Reference (to be discussed later in the agenda). He proposed a standard reporting format for the report from the taskforce to the WGDM. The reporting on the comparisons would be in priority order: BIPM-KC, CCL-KC, RMO-KC, SC. In cases where there is a problem with an NMI's results in a comparison, the reporting would continue until the time that the problem is resolved, either by flagging the CMC, or successful participation in subsequent comparisons.

The chairman thanked Dr de Oliveira for the work in setting up the taskforce and preparing the documents. He recommended that **a reporting template be set up so** that the RMOs can anticipate the required information. The report should highlight the problems as these need to be addressed. It is the responsibility of the NMI to correct the problems, the TF, WGDM and CCL can only 'police' the process, by asking the NMIs and RMOs to perform the work and to report to KCDB. The ultimate authority is the CCL, which can ask for removal of the CMC if the NMI or the RMO has not already made the request.

Alternatively, the RMO has to report yearly to the JCRB on the CMCs, so this may be a way that the CMCs become 'greyed-out' (removed) from the KCDB.

DimVIM

Nothing further to report.

CMC collections in the regions

Already discussed in the RMO reports.

CMC corrective actions guidance

Andrew Lewis presented the updated document [09-43]. He had updated it to take into account recent information and restructuring of the JCRB document server. The document was useful for both the key comparison planning process and the CMC review. **Dr Sacconi recommended that the document be kept as a single document and maintained as an ongoing item**. He asked for comments and corrections, especially from the KCDB manager and the JCRB. Dr Lewis would **update** the document after the CCL meeting to take into account new structures. Dr Balsamo requested that the document be given a number outside the yearly meeting numbering scheme, as it was a document which should be useful over many years. The chairman suggested putting it, with other 'long-term' documents, on the WGDM server. He would liaise with the BIPM regarding this.

7. MRA: Various items to be discussed

7.1 Five years review of CMCs

The RMOs have to assure the regular review of the existing CMCs and to report that they are still valid. Some CCs have decided to review CMCs, for example on a five year process, others perform the review after comparisons are reported. WGDM reviews CMCs after key comparison results are made available. This has been the policy of the WGDM and it should continue. However, it is necessary that the date of CMC review is known and that the review is conducted periodically. So far, the date of review is not recorded.

7.2 Common criteria for taking into account artefact influence for CMC (BMC)

The chairman noted that thermal expansion, deviation from ideal form, surface effects (roughness) are common items already included in uncertainty budgets used in key comparisons. These are clearly artefact dependent contributions. The majority of NMIs already take these into account in their uncertainty budgets.

7.3 Withdrawal of results from a comparison before/after draft A

Comparison pilots have sometimes asked the chairman about the possibility of withdrawing results from a comparison. The request normally comes at the time of preparation of the draft A report, when an NMI is informed that their results appear to be in error. According to the guidelines, the result can be corrected if the NMI notices an obvious error, but the result may not be withdrawn. Prof Wallard responded that the interpretation of the clause in the key comparison guidelines was to increase the confidence of the result. If the result is modified, then both the original and modified results are stated in the report. Dr Bergmans reminded the meeting that a previous WGDM decision had been made to inform NMIs of erroneous results as soon as possible in case they have serious errors ongoing in their services. The chairman suggested that the draft A report be made as simple as possible and sent as soon as possible, perhaps just as a simple spreadsheet of the values submitted, with no analysis.

7.4 Implications of the report on materials metrology for the CCL

The chairman informed the meeting that the CIPM's working group on materials metrology had recommended that the CCM and CCL should consider the case for a joint working group on mechanical properties of materials with VAMAS representation. The CCL President referred the discussion to the CCL meeting, where there was a suitable agenda item.

7.5 Revision of service level categories to meet the needs of smaller NMIs and to have consistency with the accreditation community

The chairman had examined the DimVIM and noticed that it already contained categories for the lower level services and that the DimVIM was already in use by the accreditation community. Dr Mussio responded that if ILAC wished to add further categories, then they would present that to this meeting. Dr Balsamo added that the virtual institute 'EVIGeM' had used the DimVIM as the category list and very few additional categories had to be added at the time. Ms Tan asked how lower level services can issue certificates with the MRA logo. If they wish to use a logo from ILAC, then this could be covered by local accreditation, but if these services want to issue certificates with the MRA logo, then these services must be covered by CMCs. Dr Kruger asked about the CMC claims in hardness indenters, which is a dimensional parameter, but was not reviewed by CCL/WGDM. This was not an issue provided that the CMC had been reviewed properly. The NMI or RMO chooses which CC to submit the CMCs to, based on the availability of suitable service categories.

7.6 Terms of Reference for Task Forces

Agenda item deleted at start of day 2.

TF1 on comparison linking

Agenda item deleted at start of day 2.

TF4 on CMCs

Agenda item deleted at start of day 2.

Activities in Dimensional Nanometrology (DG-N meeting)

The DG7 Nanometrology sub-meeting was chaired by Ron Dixson, where he gave his presentation – see document [09-39] for full details. Work on SRM 2059 metrology had resulted in a 50% reduction in the measurement uncertainty using CD-AFM. NIST was working with Villarrubia *et al* on tip characterisation. Nano 6 (3D structures on silicon) will use a SCCDRM 2004 specimen, of dimension 1 cm^2. The lamellae are 50 nm to 250 nm wide, spaced nominally 3 µm apart. The draft protocol is circulated and generally accepted, but scheduling is not yet agreed. Circulation is anticipated to start at the same time as that of Nano1 (linewidth, metal lines on quartz), i.e. Q1/2010. The differences between Nano1 and Nano6 were designed such that Nano1 was not limited in the measurement techniques, whereas Nano6 was limited to AFM methods. Possible future comparisons included Nano7 – atomic step heights, Nano8 – sub-nm surface roughness, Nano 9 – deep sub-micrometre pitch.

The chairman asked about Nano1 and Nano6 participation – were the participant lists ready and the protocol agreed? This was the case but additional participation should be welcomed. **Dr Dixson agreed to ask the comparison pilots to re-circulate the most recent protocols. The chairman also decided to re-populate the DG nano contact list to ensure that all NMIs that may be interested have been contacted.** Dr Bosse added that the Nano1 protocol needed revision as the artefact had changed since the last iteration.

Dr Thomas reminded the meeting that the previous Nano studies had been registered as CCL supplementary comparisons. This labelling is no longer recommended, but the question was whether or not if these comparisons should be registered as supplementary comparisons. This depended on whether or not the NMIs would be, in the near future, submitting CMCs to be supported by these comparisons. Prof Wallard responded that, in time, if these services were to be offered routinely, they should be considered as key comparison topics. The chairman was cautious of this as it would enlarge the list of key comparisons topics requiring mandatory repetition on a 7-year cycle.

Dr Dixson asked if the supply of SRMs was also covered by the CMC lists. This was the case and the DimVIM could be extended to include the supply of standard reference materials. However, as discussed during the initial period of starting the DimVIM, and as reminded by Dr Thomas, the CMC tables are not designed as a catalogue of SRMs, and the DimVIM would only include the calibration of such items, and not the entire supply process – that would be covered by the accreditation process. However it was noticed that a few SRMs were already in Appendix C.

Dr Bosse reported that PTB and NMIJ had also performed bilateral comparisons on sub-micrometre pitch standards. He suggested that a follow-up to Nano4 may be interesting to organise. Also a nanoparticles comparison would be an interesting comparison topic, perhaps in conjunction with the iMERA+ Joint Research Project. Unfortunately committee ISO 201 SC9 (AFM measurements) did not have good visibility of the results of the Nano comparisons. IEC TC113 and TC229 have started projects on the definition of the quality of artificial gratings and Dr Bosse suggested that this committee may be a route to make the outputs of the nano comparisons more available. **The chairman asked if the future reports/agendas from DG-Nano could also include an item on standardisation**. Prof Wallard reported that the BIPM would be holding a nano science/technology/metrology workshop early next year. The BIPM will send out invitations nearer the time.

Activities in strategic planning

[Taken later in the agenda, before item 9]

Dr Sacconi anticipated the future restructuring of the CCL and presented a kick off document [09-50] to start discussions. **Dr Sacconi agreed to follow the general procedure for the CC President to chair this working group, at least for the inception**. **He wanted the membership to include the chairs of the other CCL WGs, the TC-L chairpersons from the RMOs and other individuals selected by the President.** The kick off document described example terms of reference, possible

interactions with the other CCL WGs, and examples of topics which should be anticipated by the WG such as nanotechnology, image metrology, temperature metrology for dimensional metrology, picometre interferometry, large and nano-scale coordinate metrology (including freeform) for large scale applications such as aerospace and marine structures, and future evolution of existing technologies and services. Dr Sacconi welcomed discussion.

Dr Giardini and Ms Tan asked to not explicitly plan for retirement of existing technology and standards such as gauge blocks, but rather see their evolution. The chairman asked to include the activity in supporting the BIPM in the preparation of the work programme. Dr Matus asked about including work on thermal expansivity – Prof Wallard suggested awaiting the agenda point in the CCL meeting concerning the JWG between CCL and CCM on material properties. Prof Wallard added that other CC strategic working groups published documents on the major challenges for their CC, and the chairman agreed that this would be a good method of publicising the work of CCL more widely. He added that this discussion before CCL decision was to encourage discussions as WGDM had previously been responsible for this work area and wanted to ensure a good start to any subsequent group of CCL.

8. CCs and WGs: general structure and rules

Felicitas Arias spoke about the situation in other consultative committees [09-51]. Only a sub-set of the procedural rules of CCs and their working groups was previously available from the website, and a new document was in preparation which it was hoped would be made public later in the year. Terms for the CC working groups of chairpersons were not totally regulated but it was thought common to limit this to four years or two meetings of the CC. Meetings of the CCs are always at the BIPM headquarters, but the CC-WGs can choose to meet elsewhere, for example to take advantage of co-location of individuals at a conference, but in this case, they should hold some meetings at the BIPM. In all cases, meeting documents should be sent in advance and placed on the BIPM server. CC working groups on MRA matters usually include just the TC-chairpersons but comparison pilots are also invited in some CCs.

Most CCs have WGs for MRA matters and for CMCs. Some CCs have a single WG covering both these items. KCDB manager is a member of some of these WGs.

A CC's WG on strategic planning, where this is newly established, is usually chaired in the first case by the CC President. After operating for a while, the chairmanship is then transferred to another member.

The meeting opened the discussion.

Dr de Oliveira remarked that already in several CCL key comparisons, participation by non-CCL members had occurred, against the general rule. Dr Arias responded that in all cases, a justification had to be given. Dr Sacconi asked for clarification regarding the participation in CCL key comparisons and Prof Wallard confirmed that participation was limited to CC members.

Dr Pekelsky asked if persons invited by the President to take part could chair a working group of the CC. This is not usually the case unless the person was previously affiliated with the committee and a staff member of a CC laboratory, e.g. a retired expert from an NMI. Dr Pekelsky was concerned that Dr de Oliveira, from a non-CCL laboratory, would not be able to chair a working group. He was concerned, as was the chairman, that many of the TC-L chairpersons from the regions come from non-CCL members, as the TC-L chairmanship rotates frequently amongst RMO members.

The CCL president and the BIPM director suggested to Dr de Oliveira that INMETRO request membership of the CCL. If the application was made this summer, the next CIPM would be able to consider it.

Dr Prieto asked if the exceptions to the rules could be explicitly mentioned.

Dr Sacconi asked if CCs could automatically include as ex-officio members, the TC-Chairs, but Prof Wallard was concerned about this.

The chairman reminded the meeting that the SI units were to be redefined in the next few years and there would surely be much discussion at the relevant CCs. He asked for the dates of the future CC meetings to be made public as soon as possible. Prof Wallard responded that the dates are published in the minutes of the CIPM. The next CCL meeting would be in 2011.

Meeting broke for lunch at 13:15 and resumed at 14:20.

9. WGDM Proposals

9.1 Possible changes in the structure of CCL: new working groups and terms of reference; and

9.2 Possible changes for WGDM: name and terms of reference

The chairman opened this agenda point by stating that any restructuring would, of course, be performed by the CCL but WGDM could discuss this topic now as it was worth exploring possible options in the time available. He expressed the wish to keep the operation of the CCL working groups as open as possible, to continue the efficient work performed so far by WGDM, and avoid repetition of work between groups and CCL. Dr Sacconi had taken into account the requirements set out by the CIPM, plus his own experience of the work of WGDM and CCL and proposed a draft structure for the CCL working groups [09-30]. The diagram showed a WG covering all MRA work, a WG for Nanometrology and a WG for Strategy. The WG on MRA would have three task groups, TG1 on KCs, TG2 on linking and TG3 on CMCs. There would also be a (possible) joint WG with CCM on materials properties.

Prof Wallard queried if the discussion groups could be linked better to discuss the science and whether the MRA work would be better split into two WGs. The chairman responded that the DGs were placed under the WG-MRA because the majority of their work was in preparing the key comparisons. They could interact with the WG-Strategy on strategic items.

Dr Arias asked about the three task groups of WG-MRA - would they be separate entities or part of the WG-MRA. Dr Arias asked if the DGs could be part of WG-KCs. Dr Pekelsky responded that the original intention of the DGs was to have technical discussions and it was simply convenience that the DG moderators became the key comparison pilots. Dr Sacconi's opinion was that having a single group covering all the MRA aspects had worked well so far, which was why he preferred to keep the two processes (KCs and CMCs) together in one group. Dr Balsamo supported the structure as presented and viewed the internal operation of the WG-MRA as a second level of detail for discussion. He was concerned about the difference in size across the three working groups as he thought that the WG-MRA would be a group similar in size to the current WGDM. Dr Arias added that the WG-Strategy was also concerned with any possible future re-structuring of the CCL and it was easier for a small group to do this than to achieve consensus across a large group.

Dr Lewis mentioned the holistic process he had observed in preparing the CMC actions document in that he found it difficult to separate the CMC review process from the operation of the key comparisons. He also noted that one of the new CCL WGs (WG-Nano) was previously a discussion group. Its work so far had included much that was not involved with key comparisons and mentioned that the future CCL comparison portfolio would not be limited to the current DG topics.

Dr Giardini considered that the Working Groups had to actually perform work, and so they should be formed at a size that was optimum for their work tasks. He added that the large group which took collective responsibility was the CCL and that the work performed in the discussion groups was important and this should have direct reporting to the CCL, of distilled information which was testable.

Dr Pekelsky viewed the diagram as too hierarchical – he hoped, as did Dr Giardini, that the DGs and all the WGs would report directly to the CCL. He hoped that the future reports to CCL would be like the current reports to WGDM, except that the CCL was the primary audience. Dr Thomas agreed and asked if the DGs could be joined into a WG, perhaps called something like WG-Dimensional

Metrology. She added that other CCs had some WGs which met between the CCL meetings, sometimes as frequently as every six months. The consensus was that the diagram was a figure and that the actual process would be more horizontal with direct reporting to the CCL.

Dr Sacconi summarised that the various possible structures had been discussed and the merits and problems of each were highlighted. He expressed the wish that the WGs and TGs would perform the majority of their work before the meetings and that they would not report on items that needed no further discussion. He again encouraged those that would be attending the meetings of the various structures in the future to ensure that documents were prepared and submitted well in advance.

The chairman showed a summary of the existing WGDM Task Forces and Discussion Groups and their terms of references and memberships. These may be useful to refer to when the CCL makes its decisions on the restructuring as the tasks undertaken by these taskforces are similar to the tasks that will need to be considered by the new CCL Working Groups. The membership of WG-Nano would need to be more carefully specified as it would be a formal CCL working group and had to follow the rules.

Ms Tan asked if a non-NMI member could take part in a discussion group. Prof Wallard mentioned that there were preferences expressed at several committees that work under the Metre Convention should be limited to members of the Convention. Occasionally experts could take part, but as exceptions, rather than the norm. Dr Sacconi added that there was a possibility that the DGs would report directly to the CCL – this could have implications on their membership.

Dr Sacconi described the unique characteristics of the dimensional field. In TCM, for example, the technical disciplines of mass, force, pressure etc were very different and so the work had to be split into different fields for discussion by different experts. In CCL, there was enough overlap between the different sub-fields that splitting into separate groups was unnecessary. The CCL President asked that any delegates should contact him between now and the discussions in the CCL, if they had opinions not yet expressed, regarding the restructuring of the CCL.

9.3 Conclusions and recommendations to CCL

The chairman proposed that no formal recommendation would be prepared as the CCL President had been present during the discussions and could take the arguments expressed to the CCL meeting of the next day.

10. WG documents on the BIPM server

The chairman showed the WGDM website. He asked which documents should be made available to public access and which documents should be made available, with restricted access, outside of the meeting documents. The latter set of documents would be regarded as ongoing working documents. This would be at the same heading level as the Executive Reports part of the restricted access area. Dr Miles gave advice on the location of the documents. She advised that the easiest process was for each meeting (WGDM, CCL, WG-X future) to decide on which of their own documents should be identified as being open.

Dr Miles recommended that the previous WGDM minutes be made available. The chairman agreed. Dr Balsamo thought there were two pairs of attributes: open/restricted, dated meeting/long term relevance. These lead to four possible combinations of attributes. Dr Arias mentioned that any document can be made open as soon as required by requesting this from the Executive Secretary of the CCL. Up until now Dr Vitushkin had performed the web updates but he (and Mr Felder) were retiring in 2009.

The chairman would speak with Dr Miles and propose a suitable selection of documents to be made available. This would be communicated to the WGDM via, for example an email bulletin.

11. Any other business

The list of action items was examined and edited. The chairman would extract items for the presentation to the CCL meeting.

12. Next meeting

The chairman anticipated that there may be no further meetings of the CCL-WGDM. The chairman had, however, received invitation to host a WGDM meeting in Singapore and he hoped that the future working groups of the CCL may take up the offer. Ms Tan confirmed the invitation and mentioned that there would be some World Metrology Day events (20 May 2010) and that this would be the best timing for any meeting to come to Singapore, but other dates were available, probably better in May or September to avoid summer holidays. It was to the new working groups to decide.

The Chairman thanked BIPM for the kind hospitality.

The CCL president thanked the WGDM chairman for preparing and chairing the meeting.

The meeting closed at 17:35.

LIST OF ACRONYMS USED IN THESE MINUTES

(NMI acronyms are listed in the list of participants)

AFRIMETS	Inter-Africa Metrology System
APMP	Asia Pacific Metrology Programme
BIPM	Bureau International des Poids et Mesures
CC	Consultative Committee
CCL	Consultative Committee for Length
CCL-K*n*	CCL Key Comparison number *n*
CMC	Calibration and Measurement Capability
COOMET	Coopération Métrologique (Euro-Asian RMO)
DG	WGDM Discussion Group
DimVIM	Document listing CMC categories for Length services, produced by CCL-WGDM
EURAMET	European Metrology Organization (European RMO), formerly EUROMET
JCRB	Joint Committee of the Regional Metrology Organisations and the BIPM
KC	Key Comparison
KCDB	Key comparison and calibration database (of the BIPM)
KCRV	Key comparison reference value
MRA	Mutual Recognition Arrangement
NMI	National Metrology Institute
RMO	Regional Metrology Organization (*e.g.* EURAMET)
SADCMET	Southern Africa Development Community Cooperation in Measurement Traceability (RMO)
SC	Supplementary Comparison
SIM	Systema Interamericano de Metrologia (Inter-American RMO)
TC	Technical Committee
TC-L	Technical Committee for Length
WGDM	CCL Working Group on Dimensional Metrology
WGFS	CCL-CCTF Joint Working Group on Frequency Standards
[09-xx]	Short form reference to WGDM/09-xx documents

LIST OF ITEMS DECIDED AT THE 14th WGDM MEETING

WGDM-2009.D1 The CCL-WGDM 2008 **minutes** were **approved.**

WGDM-2009.D2 The WGDM **decided** to keep available the option to operate **both** 'classical' and CCL-RMO [09-22] styles of key comparison, as best befits the individual comparison needs. CCL decides on the operation of the key comparisons.

LIST OF RECOMMENDATIONS MADE AT THE 14th WGDM MEETING

WGDM.2009.R1 Regarding the operation of the new CCL-K11 comparison, WGDM **asks** the **CCL to recommend to the CIPM** that the **expertise of the BIPM headquarters staff** in laser standards and fs-comb systems could be made available during the transition to the operation of the new comparison.

WGDM.2009.R2 Regarding the operation of the new CCL-K11 comparison, WGDM **recommends** the use of the current CCL-K11 protocol for the **calibration of stabilised lasers** such as lasers belonging to the former Mise en Pratique document.

WGDM.2009.R3 Regarding the participation in the new CCL-K11 comparison, WGDM **recommends** node laboratories to be aware that they **should accept participation** by any NMI of a **Member State**, but also be aware that **Associate Members** require **special arrangements** to be made.

WGDM.2009.R4 Regarding the DimVIM CMC categorisation list, WGDM **recommends** that the categories 1.1.1 and 1.1.2 be left **un-edited** at this time, but **requests** the WGFS to **inform** the relevant CCL working group (currently WGDM) of any additional parameters that need to be added to the existing wording, for example 'frequency stability' and 'linewidth'.

WGDM.2009.R5 Regarding the calibration of fs-combs, the WGDM **recommends** that this should **not** be part of comparison CCL-K11, but subject to a **different comparison exercise**, to **be discussed by the JWGFS**, and that **separate CMC categories** be created for these new calibration services.

WGDM.2009.R6 Regarding the operation of the nodes in CCL-K11, the WGDM **recommends** that the **node laboratories check the performance of their own lasers**, but that this be performed as part of the NMI's **internal quality system** rather than as a separate, 'blind' exercise.

WGDM.2009.R7 Regarding the operation of comparisons, the WGDM recommends that the future planning of key comparisons **include more strict rules**, especially regarding the transmission of the results in a **timely** fashion to the pilot.

WGDM.2009.R8 Regarding the document [09-43], the WGDM recommends **re-numbering** and **re-titling** the document and making it available as an **ongoing resource**, to be **updated** periodically.

WGDM.2009.R9 The WGDM recommends that comparison pilots **issue** the draft A report in a simplified form, **as soon as possible** and only contacts NMIs for corrections if potential errors are noticed, and **not as a general rule**.

WGDM.2009.R10 The WGDM recommends that the current draft protocol for comparison CCL-K1.2009, as presented during the WGDM meeting 2009 [-0-31-1], be accepted by the CCL.

WGDM.2009.R11 The WGDM recommends that WG-S include the subject of thermal expansion as an item for future discussions.

LIST OF ACTIONS FROM THE 14th WGDM MEETING

A.1 **All presenters** to forward copies of their reports (if not already sent) and any presentations made at the meeting, to **the Rapporteur**, for numbering and entry to the WGDM web site.

A.2 The **Rapporteur** to forward the approved minutes of the 2008 meeting to **Dr Vitushkin**, for placing on the WGDM web server.

A.3 The **pilot of Nano 6** to send a comparison registration form to Dr Thomas.

A.4 **All delegates** making presentations at future meetings to send documents for the meeting at least **one week in advance** of the meeting, for placing on the document server.

A.5 **Dr Fira** to **edit** future COOMET reports to refer to KCDB numbering of comparisons.

A.6 **Dr Vailleau** to ensure the SIM-EURAMET.L-K8 comparison **is re-numbered** as a EURAMET comparison and **registered** with the KCDB.

A.7 **Dr Viliesid** to register CCL-K1.2009 with the KCDB and ensure that the protocol, when fully prepared, is **approved by the CCL**.

A.8 RMOs (**TC-L chairpersons**) to nominate a limited **participation list** for CCL-K1.2009 to Dr Viliesid by 15 September 2009.

A.9 **NMIs** with **thermal expansivity** CMCs to **check the DimVIM** to ensure that they are registered with the correct classification.

A.10 **Dr Bosse** to **register** the comparison EURAMET.L-K3.2009 with the KCDB.

A.11 Any **NMIs** wishing to join **EURAMET.L-K3.2009** should contact Dr Bosse soon.

A.12 **Dr Thomas** and the **Chairman** to **remove PTB** from the participant lists (the KCDB and the KC planning documents, respectively) for APMP.L-K5.

A.13 **Ms Tan** to consider if there was sufficient linking via common participants when planning the APMP 500 mm linescale comparison.

A.14 **All NMIs** performing R&D on **surface texture measurements** to contact **Dr Baker** with information on their work, so that DG8 may be fully informed.

A.15 BIPM (**Prof Wallard**) to see if the recent summary document with the new **legal information** concerning the Metre Convention, could be made more widely available.

A.16 **Dr Decker** to take on board the discussions regarding the linking process in order to reword the draft terms of reference.

A.17 **The chairman** to edit document [09-22] to: correct the **Lab1 icon**; add text concerning the **'virtual CCL comparison'** formed by the overlapping participants; add text concerning the **advantage** of increased frequency of available comparisons by running them time-phased.

A.18 **The chairman** to **update** the comparison planning Excel file to take into account the changes in CCL membership and **place** on the WGDM server.

A.19 **Dr de Oliveira** to prepare a **standard template** document for use by the RMOs when reporting CMC issues to the CMC TF.

A.20 **Dr Lewis** to **update** the document [09-43] after the CCL meeting to take into account any comments received.

A.21 **The chairman** to liaise with BIPM regarding setting up a **'long-term' documents list** on the WGDM server.

A.22 **Dr Dixson** to ask the Nano1 and Nano6 pilots to **re-circulate the protocol documents** to the current participant lists.

A.23 **The chairman** to contact WGDM to ensure the **DG-Nano contact list** is up to date and to ask the Nano1 and Nano6 comparison pilots to check for **additional participants** using the updated lists.

A.24 **DG-Nano chairperson** to add an item on standardisation to future agendas/reports.

A.25 **Dr de Oliveira** to ask for INMETRO to **apply for CCL membership**.

A.26 **Pilots** of comparisons currently under planning or being operated should send the protocol as a PDF document to the KCDB manager.

A.27 **The chairman** to send the **final report** on comparison APMP.L.K1.1 to the KCDB manager.

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