



EUROMET Technical Committee for Electricity and Magnetism (TCEM) Chairman's Annual Report for 2004/2005

1. Introduction

The work within the TCEM is organized as follows: More general issues are under the responsibility of the Technical Committee, whereas technical issues are dealt with in the three sub-fields "DC and quantum metrology", "Low frequency" and "Radiofrequency and microwave". The TCEM met in autumn 2004 and the sub-groups held informal meetings on the occasion of the CPEM 04 in London.

CMCs and comparisons dominated the work of the TCEM in the period under review. This will change in the coming year, because the TCEM is preparing for the iMERA project. The number of ongoing comparison projects is still high, it will however decrease in the near future, because many comparisons are now at a Draft A or Draft B stage. This will enable the TCEM to intensify their activity on the technical issues in future.

2. Meetings

The **TCEM** met on October 14 and 15, 2004 in Warsaw, Poland. Main topics of the agenda were

- reports on new developments within EUROMET and other regions, the CCEM and its working groups, and the activities of the TCEM sub-groups
- a review of ongoing and new projects
- presentation of the metrology systems of "New Members" and "Associates"
- technical talks on the precise measurement of self inductances and a new comparator for the comparison of inductances
- introduction to the MERA and iMERA projects
 - MERA conclusions and summary
 - the iMERA project
 - a new type of EUROMET Project: Co-ordinated research and development project
 - future activities of the TCEM in view of the European Research Area in Metrology

The MERA and iMERA projects occupied a large part of the discussion. The contact persons of the TCEM observe the development with great interest, the more as they believe, that the iMERA project could provide a good opportunity to strengthen the position of scientific metrology in Europe.

The **sub-field "DC and quantum metrology"** held an informal meeting on the occasion of the CPEM 04 in London. The next official meeting will be held in May 2005 at METAS in Bern, Switzerland. The convenor gave a short presentation of the state-of-the-art of quantum standards for current, voltage and resistance in Europe, and the progress made during the last year. He underpinned the necessity for a co-operation in research especially in this field and gave examples of successfully completed projects.

An informal meeting on the **sub-field "Low frequency"**, which was mainly concerned with ac/dc transfer, was held during CPEM 04 in London. Discussion on ongoing and recently

completed comparisons in ac/dc transfer and a review of the low-frequency projects were the points of the agenda. Furthermore many laboratories have already started activities in the field of power quality, which will become an important issue in the near future. The next meeting will be held in May 2005 at CEM in Madrid, Spain.

An informal meeting on the **sub-field “Radiofrequency and microwave”** was held in parallel to CPEM 04 in London. In addition, two seminars on “New challenges at rf and microwaves” (EUROMET Project 648) and “Rf cw power measurements” (EUROMET Project 726) were jointly organised by NPL and LNE in December 2004 in Paris. As regards the sixteen technical areas identified in Project 648 for potential scientific co-operation, reports were given on *Communications metrology*, *Time domain metrology*, *On-wafer metrology*, *THz metrology*, *Field probe calibration* and a *Survey of modelling software*. Within the CW Power Workshop an *Overview of novel power standards* was presented. In addition, the EC FP V Project *EMMA (Electromechanical Micro-components for Precision Applications)* occupied a large part of the seminar. The next meeting of the sub-field will be held in April 2005 at METAS, Switzerland.

As the present convenors for the sub-fields concluded their second terms, the TCEM have elected new convenors for the three sub-fields. These are:
Francois Piquemal, LNE, France, for the sub-field “DC and quantum metrology”,
Karl-Erik Rydler, SP, Sweden, for the sub-field “Low frequency” and
Zoran Svetik, SIQ, Slovenia, for the sub-field “Radiofrequency and microwave”.

3. Projects

Detailed overview of the EUROMET Projects in the field of Electricity and Magnetism can be obtained from the EUROMET website. The table below gives only a brief overview of ongoing and completed projects. In the period under review, the number of ongoing projects has increased by about 20 % (mainly comparison and consultation projects).

	Comparison	Co-operation	Traceability	Consultation	Total
Ongoing	31 (28)	7 (7)	8 (7)	7 (2)	53 (44)
Completed	41	34	2	40	117
Total	72	41	10	47	170

(Figures in brackets denote the numbers of the previous period)

Compared to the previous period, the total number of ongoing projects has increased from 44 to 53. With about 60 % of the total number of projects, comparisons are still dominating. The large number of comparison projects reflects the CCEM and BIPM comparison activities in the fields of DC&LF and RF. Beyond that, the number of traceability projects has increased by one, from 7 to 8. In the future, it is intended to increase the number of projects for co-operation in research as well.



4. Comparisons

Presently, 22 EUROMET key or supplementary comparisons (12 KC's, 10 SC's) are active in the field of Electricity and Magnetism. These numbers will decrease in the near future, because 12 comparisons are already in a Draft B stage and will soon be approved. The total number of comparisons amounts to 17 KC's and 19 SC's.

5. Status of EUROMET EM CMCs

The TCEM completed the Intra RMO Review of its 3rd CMC round for 6 countries submitting their first set of CMC's in December 2004. The CP's representing these countries introduced their metrology systems and NMI's on the occasion of the TCEM CP meetings in Vienna (2003) and Warsaw (2004). The CMC's of the 3rd round are presently under Inter RMO Review. This gave us the opportunity to gain first experience with the newly installed and internet-based review system of the JCRB.

At the same time, the TCEM started an Intra RMO Review for the 4th round with 10 countries submitting new and revised CMC's.

For the next revision of EUROMET Guide n° 8, the TCEM suggests to replace the questionnaire given in annex 3 by a new one which has been developed by the TCEM for use with the third round of CMCs. From our experience the present questionnaire is partly misleading and causes wrong answers. The new questionnaire (see Appendix A) comprises 4 blocks of questions which concern the participation in comparisons, technical activities, the quality management system and additional information which might be of interest.

6. Inter-regional contacts and collaboration

RMO TCEM Chairpersons Meeting

An RMO EM TCC meeting was held in Paris in March 2005. Discussions included

- matters arising from the last meeting
- status reports from TCEM chairs
- CMC work after the end of the transition period of the MRA
- new CMC review procedure
- discussion of the impact of CCEM and RMO comparisons on CMC claims of the NMIs
- installation of a CCEM Working Group on CMCs

JCRB document JCRB-11/7(a) defines a clear chain of responsibility to assure that the CMC claims are in line with the results obtained in KCs and SCs:

- The NMI making a CMC claim has the primary and principal responsibility
- Through its Technical Committees, the RMO should monitor the impact of KCs and SCs. on the CMC claims of its member NMIs
- The CCs should install Working Groups on CMCs intended to provide guidance on the range of CMCs supported by particular KCs and SCs
- Identify areas where additional KCs and SCs are needed
- Co-ordinate the review of existing CMCs in the context of new results of KCs and SCs



In the following discussion, the need for a formal group was generally supported. The RMO EM TCC decided to recommend to the CCEM constituting a working group, which in addition to the review of already existing CMCs in the light of the results of new KCs and SCs would have the additional task of co-ordinating the activities of the RMOs. The name of the new group should be "CCEM Working Group for RMO Coordination (CCEM WGRMO)". The informal RMO TCEM chairperson meetings should be converted into formal meetings of the WGRMO (Note: On its 24th meeting in March 2005, the CCEM approved this proposal. Dr. Giancarlo Marullo Reedtz, IEN, Italy was elected as chairman of this working group.)

Inter RMO Review of CMCs

none

Guidelines on Comparisons

The CCEM approved *Guidelines for Comparisons* which can be downloaded from the Internet: <http://www.bipm.fr/en/committees/cc/ccem/guidelines.html>. The guidelines are built-up in a modular form with a main document which describes how to plan, organise, conduct and report comparisons and with 7 annexes which among others give a chart for organising comparisons and suggested outlines for protocols and reports.

7. Co-operation in Research (The MERA and iMERA Projects)

The TCEM started actively to get ready for the implementation of the iMERA project. The MERA and iMERA projects had been presented at the last TCEM meeting in Warsaw and had formed one of the main topics of the meeting. The delegates had been informed about the projects, and possibilities had been discussed how to transfer the already existing co-operation projects into projects for co-operation in research. This discussion was continued at the two workshops in Paris and will be intensified and detailed at the coming meetings of the sub groups and the TCEM contact persons meeting.

iMERA will considerably influence the activities of the EUROMET TC's. Future work will be focused more on scientific activities and R&D, while comparisons and CMC activities will take a back seat. It will be the task of the TC's in the near future to develop roadmaps and working programs for their subject fields and the associated sub fields. Later on they will also be responsible for proposing projects in the frame of the working programs.

To organize this work within the TCEM, an iMERA working group, which will act as a kind of steering committee of the TCEM for iMERA is to be discussed. This group should meet in advance of the annual contact persons meetings and report to the TCEM about the developments within iMERA. The iMERA working group should be a small group of experts who by the help of some other people draw up the roadmap for measurement needs in electricity and magnetism and co-ordinate the projects within the work programmes.

Hans Bachmair

Braunschweig, 15 April 2005

Technical Committee Chairman for
Electricity and Magnetism



Appendix A

Questionnaire for the Review of EUROMET CMCs

Subject Field: Electricity and Magnetism

NMI:	
Person responsible:	
Measurement quantity	(Please report the measurement quantity/ies to which the information reported below applies)

Participation in comparisons	
CC or EUROMET KCs ?	(Please name comparison identifier)
Supplementary Comp. ?	(Please name comparison identifier)
Past comparisons ?	(CIPM, EUROMET or others, please specify)
Bilateral comparisons ?	(Please specify)

Technical activities	
Measurement methods	(Brief description of the methods used)
Measuring equipment	(Please specify)
Traceability of standards	(Name NMIs which provide traceability)
Written measurement instructions	(Written procedures available? Language?)



Uncertainty budgets	(Are they already available? If yes, are they calculated following the ISO Guide to the Expression of Uncertainty in Measurement?)
Laboratories	(Site, space, etc.)
Environmental conditions	(Temperature, rel. humidity, shielding etc.; please specify)
Qualification of staff	(Name, education, degree; supervisors and operators only)
Publications/Conferences	(Please specify)

Quality management system	
Structure of the National Metrology system	(Role of the NMI or the institute(s) submitting CMCs within this system)
Status of implementation of ISO 17 025 QMS?	(Fully implemented?)
Self-declared or accredited QM system ?	(If accredited, please name accreditation body.)
Which CMCs are covered by the accreditation ?	(Are all CMCs covered by the accreditation? If not, please specify the corresponding areas of measurement)
Which CMCs are covered by self-declaration?	(List here all areas of measurement which are not covered by accreditation)
Engagement in the QS-Forum	(Participation in meetings and other activities)
QM system reviewed by QS-Forum ?	(Meeting when the QMS was presented, status of review)



Additional information	
Participation in EUROMET technical activities ?	(Projects, meetings etc; please specify)
Visits of technical experts ?	(Please specify name and date of visit)
Peer reviews ?	(Please specify names and date)
Any other information ?	(Please specify, if relevant)