1st Technical Committee Chairpersons Meeting

28th – 29th February 2008

Item 01.08.08 – Report from TC-Mass and Related Quantities

1. Projects

In the period under review (Mar 2007 – Feb 2008) in TC area of Mass and Related Quantities the numbers of proposed, agreed and completed projects in the various categories are shown in the table below. The previous years numbers are shown in brackets. The 2008 TC-M meeting will take place from 5th to 7th March at which a number of new projects will be proposed.

	Comparison	Co-operation	Traceability	Consultation	Total
Proposed	9 (7)	5 (4)	-	-	13(11)
Agreed	15 (17)	11 (13)	3 (3)	1 (1)	30 (34)
Completed	27 (22)	27 (25)	6 (6)	11 (11)	71 (64)
Total	**51 (46)**	**43 (42)**	**9 (9)**	**12 (12)**	**114 (109)**

The projects can be broken down by technical area as follows:

	Proposed	Agreed	Completed	Total
Density		2	5	**7**
Force	4	6	2	**12**
Hardness			1	**1**
Mass	4	13	28	**45**
Pressure	5	10	27	**42**
Torque	1		1	**2**
Viscosity		1	4	**5**

2. Status of Comparisons in Mass and Related Quantities

There are currently 21 registered European Regional Key Comparison in the area of Mass and Related Quantities, of which 11 are active, 4 have provisional equivalence, 6 have been approved for equivalence. Details are given in the table below.

Comparison ID	Project no.	Subfield	No. of part.	Pilot	Status	Years
EUROMET.M.M-K1	215 C	Mass	10	NPL	Approved for equivalence	1992-1999
EUROMET.M.M-K2	445 A	Mass	25	SP	Report in progress, Draft B	2001-2003
EUROMET.M.M-K2.1	786 A	Mass	5	SP	In progress	2004-
EUROMET.M.M-K4	510 A	Mass	26	NPL	Report in progress, Draft B	1999-2003
EUROMET.M.M-K4.1	510 A	Mass	26	MIRS	In progress	2007-2008
EUROMET.M.D-K1	339 C	Density	12	METAS	Provisional equivalence	1998-1999
EUROMET.M.D-K4.Prev	236 C	Density	5	IMGC	Provisional equivalence	1993-1994
EUROMET.M.D-K2	627 A	Density	8	PTB	Report in progress, Draft B	2001-2002
EUROMET.M.D-K4	702 A	Density	11	IMGC	Report in progress, Draft B	2003-2006
EUROMET.M.P-K1.a	442 A	Pressure	10	BNM-LNE	Approved for equivalence	1999-2002
EUROMET.M.P-K1.b	442 A	Pressure	7	BNM-LNE	Approved for equivalence	2000-2002
EUROMET.M.P-K2	305 C	Pressure	6	PTB	Approved for equivalence	1994-1995
EUROMET.M.P-K3.a	439 A	Pressure	8	LNE/NPL	Approved for equivalence	1999-2001
EUROMET.M.P-K3.b	439 A	Pressure	13	NPL	Report in progress, Draft B	1999-2001
EUROMET.M.P-K4	389 C	Pressure	14	NPL	Report in progress, Draft B	1998-1999
EUROMET.M.P-K5	045 C	Pressure	7	BNM-LNE	Provisional equivalence	1993-1995
EUROMET.M.P-K6	110 C	Pressure	6	BNM-LNE	Provisional equivalence	1992-1994
EUROMET.M.F-K1	535 A	Force	9	MIKES	Report in progress, Draft A	2002-2004
EUROMET.M.F-K2	518 A	Force	10	NPL	In progress	2007-2008
EUROMET.M.F-K3	505 A	Force	11	PTB	In progress	2005-2007
SIM-EUROMET.M.P-BK3	439 A	Pressure	2	PTB/CENAM	Approved for equivalence	2001-2002
SIM-EUROMET.M.P-BK3	439 A	Pressure	2	PTB/CENAM	Report in progress, Draft B	2002

There are also 10 supplementary comparisons, four of which have been carried out over the last year. Of the ten comparisons seven have been published and three are awaiting the publication of the final report.

Comparison ID	Project no.	Subfield	No. of partic.	Pilot	Status	Years
EUROMET.M.V-S1	273 C	Viscosity	4	PTB	Published	1992-1993
EUROMET.M.V-S2	303 C	Viscosity	5	PTB	Published	1993-1996
EUROMET.M.V-S3	415 C	Viscosity	12	PTB	Published	2000
EUROMET.M.V-S4	415 C	Viscosity	8	PTB	Published	1997
EUROMET.M.M-S1	461 A	Mass	15	CMI	Report in progress, Draft B	2001-2005
EUROMET.M.P-S1	788 A	Pressure	2	METAS	Published	2004-2005
EUROMET.M.P-S2		Pressure	2	PTB	Published	2006
EUROMET.M.P-S3		Pressure	2	LNE	Report in progress, Draft A	2006
EUROMET.M.P-S4		Pressure	2	LNE	Report in progress, Draft B	2006
EUROMET.M.F-S1		Force	2	NPL	Published	2005-2006

3. CMCs

3.1 2007 Submission

- The last submission EUROMET.M.7.2007 was submitted in May 07.
- SIM and APMP reviewed the submission and posted comments August 07.
- The submission was revised and resubmitted based on comments from these RMOs (Sept 07).
- Not all (revised) submissions were accepted (by APMP). Final report from APMP Feb 08
- Accepted submissions were published in the BIPM KCDB (Feb 08).

3.2 Latest Submissions

The latest CMC submission from the EUROMET TC-M will be made at the end of April 08.

An annual review timetable for EUROMET TC-M submissions was outlined and agreed at the last TC-M Contact persons meeting. The timetable is:

- Proposed changes submitted to TC chairman **Sept**
- Submissions reviewed by EUROMET review team **Oct – Feb**
- Any outstanding issues concluded (at CP meeting) **Mar**
- Agreed CMCs submitted to JCRB website for review by other RMOs **Mar**
- Comments from other RMOs received ***June***
- Modifications to submissions ***Sept***
- Agreed CMCs published in the BIPM KCDB ***Sept***

The Submission of CMC from NIS (Egypt) via EUROMET has been agreed by TC-M and EUROMET Chairmen. A peer review visit to NIS was carried out in February 2008. TC-M CMCs have been reviewed by the technical area experts, submission of the CMCs for inter-regional review will be agreed at the TC-M meeting at the beginning of march.

3.3 CMC issues

- An annual review timetable works well (the review process takes place from October (deadline for submission) to September (target for publication) but;
  - One submission with multiple changes is cumbersome and takes longer to review
  - Multiple submissions (e.g. by measurement area) difficult to administer
- There are some issues with Key Comparison support for CMC values
  - What happens when KC uncertainties limited by transfer std. stability etc.

  - The status of bilateral comparisons was questioned at the last TC-M meeting (KC protocol MUST be followed, use of independent MI to analyse data?)
  - KC cannot cover the entire CMC range some latitude is necessary
- Intra-regional Review of (changes) to EUROMET CMCs
  - Currently by a “review team” – 1 expert in each area (plus chairman)
  - Proposal to circulate (with 2 week deadline) for comment by all CPs
- Changes to CMC values should be significant
- All submissions should be supported by documentation
- **A review of best practice among TCs may be useful**

4. Meetings

4.1 Mass and related quantities TC meeting

The Mass and related quantities TC meeting for 2007 was held at in Teddington UK from the 28th February to the 2nd March. The meeting included nine technical sessions to review progress in projects in the fields of mass, force, pressure, density. Additional workshops were held in the areas of mass pressure and dynamic measurement.

The TC meeting was attended by 66 delegates from 31 countries and also included representatives from the European Commission (IRMM) and the BIPM. For the first time two participants from NIS Egypt also attended the meeting. At the Contact Persons meeting Andy Henson, from the NPL International Office, made a presentation on “Developments in EURAMET and the EMRP”.

4.2 Next TC-M meeting

The next EUROMET TC-M CP meeting will be held in Bucharest, Romania from 27th to 29th February 2008. Over 80 delegates have registered from 34 countries. Several new projects will be proposed and CMC issues will be discussed.

5. EUROMET adoption of the EA Special Calibration Documents

The status of the following documents was discussed at the TC-M meeting in 2007. The status of the guides as of February 2008 is give below:

EA-10/03 *Calibration of pressure balances* (1997):
The section on the evaluation of uncertainty is being updated. This will be completed at the TC-M meeting in March 2008.

EA-10/04 *Uncertainty of Calibration Results in Force Measurements* (1996):.
A EUROMET project (887) has been set up to review this document. The review will be discussed at t the TC-M meeting in March 2008.

EA-10/14 *EA Guidelines on the Calibration of Static Torque Measuring Devices* (2000): Conversion to EUROMET document completed.

EA-10/16 *EA Guideline on the Estimation of Uncertainty in Hardness Measurements* (2001): Conversion to EUROMET document completed.

EA-10/17 *EA Guidelines on the Calibration of Electromechanical Manometers* (2002):. **Conversion to EUROMET document completed.**

EA-10/18 *Guidelines on the calibration of non-automatic weighing instruments* (2005): Conversion to EUROMET document completed.
A Spanish version has been produced by with the aid of CEM for use (mainly) in South America.

6. The iMERA Project and the EMRP

IMERA roadmaps in four areas (Mass, Force, Pressure and Dynamic measurement) have been developed and are part of the European Metrology Research Programme Draft Document. The roadmaps were reviewed at the last TC-M meeting (March 07). An EMRP project on the development of a mise-en-pratique for the kilogram re-definition was submitted but was not selected for funding. Collaborative projects with the EURAMET area will be set up to address the need for this work. The CCM also has set up working groups to address the requirement of a kilogram mise-en-pratique.

7. Redefinition of the Kilogram

The target date for the redefinition is still the CIPM meeting in 2011. The CCM met in March to review the status of the various redefinition projects and to draft its report to the CIPM. The report made the following recommendations;

- At least three independent experimental results should yield values of the relevant constants with relative uncertainties no larger than 5 parts in 10^8. One of these results should be derived from work being carried out by the International Avogadro Coordination project. At least one of these results should have a relative standard uncertainty no larger than 2 parts in 10^8;

- Values of the Planck and Avogadro constants obtained from the Avogadro experiment and the watt balance experiments should be consistent at the 95 % level of confidence;

- When the above conditions are met, the subsequent redefinition of the kilogram shall be based on the values of fundamental constants being recommended by CODATA;

- After redefinition of the kilogram, means of making an experimental link to the Planck constant or the mass of a suitable atomic or elementary particle must be maintained and simplified; although it is premature to specify how many experimental facilities will be required, at least one of these experiments should be able to make this link with a relative standard uncertainty no larger than 2 parts in 10^8;

- The creation of a workable *mise en pratique* for realizing the new unit of mass with the required continuity and stability is considered to be of crucial importance. However, until more experimental evidence is in hand, it is premature to specify a precise *mise en pratique*

- If all above conditions are met, there should be minimal impact to stakeholders in the field of mass metrology.

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