

## 1. General Aspects

This report summarises the activities of Euramet Technical Committee for Thermometry for the period 2014/15.

The technical committee has one sub-committee for Humidity and moisture (chair Vito Fericola, INRIM), and four working groups (WGs): WG on CMC Review (chair Helen McEvoy, NPL), WG on Strategy (chair Dolores del Campo, CEM), WG on Best Practice (Chair Martti Heinonen, VTT [MIKES]) and WG on Thermophysical Quantities of Materials (Chair Jean-Remy Filtz, LNE).

The WG on Strategy has been particularly busy producing TC-T input into the SRA, this built on roadmapping exercises for the three technical areas of temperature, humidity and thermal quantities.

## 2. Projects

The status of all TC-T projects can be viewed on the TC-T project database. Apart from the new projects started since the last annual TC-T meeting (February 2015), the database reflects the status of the current projects. Three new Euramet TC-T projects were proposed for 2015. Updated project reports have been received from all project coordinators except for project 930 coordinated by BEV. The latter is because the contact person has left the institute. The status of this project will be reported next year when a new contact person has been appointed.

## 3. Comparisons

A number of KC led from CCT in Thermometry and the related field of Humidity are in progress:

**CCT-K6** (dew/frost point range  $-50\text{ }^{\circ}\text{C}$  to  $+20\text{ }^{\circ}\text{C}$ ). final report is approved for equivalence and has been submitted to the BIPM KCDB/Metrologia Technical Supplement.

**CCT- K6.1** NPL/NZ Comparison of humidity standards: dew and frost point temperatures:  $-50\text{ }^{\circ}\text{C}$  to  $20\text{ }^{\circ}\text{C}$  - reporting in progress, Draft A

**CCT-K8** (dew-point range  $+30\text{ }^{\circ}\text{C}$  to  $+95\text{ }^{\circ}\text{C}$ ) reference measurements complete and circulation to start May 2015.

**CCT-K9** comparison of SPRTs calibration at fixed points from Ar to Zn is progressing. The measurements at the pilot laboratory (NIST) are completed and follow-up measurements have been completed at many participants' laboratories. Five EURAMET laboratories are participating in this KC. The protocol for the regional extension of CCT-K9 (EURAMET.T-K9) has been approved by CCT-CMC. CNAM-LNE is the pilot of this comparison, INRIM, NPL, PTB and VSL are acting as sub-pilots. Comparison artefacts are expected to arrive at the sub-pilots in June 2015.

**CCT-K10** for Radiation Thermometry (Primary realization above Ag fixed point) has been initiated. NPL is the pilot. The protocol has been agreed, the initial measurements at NPL are complete and the artefacts are circulating in the APMP region. NMIJ and NIM have completed their measurements and the artefacts are on route to KRISS.



In addition there are a number of Euramet comparisons underway.

**EURAMET.T-K8** comparison (Dew-point temperature in the range 30 °C to 95 °C, Project 717) is close to completion: the measurements were completed and the Draft A report is expected end June 2015.

**EURAMET.T-xx** (project 1352) relative humidity at temperatures in the range -40 °C to +20 °C to be started, piloted by INTA, Spain. Measurements to begin October 2015.

**EURAMET.T-S3** (comparison of the calibration of Pt/Pd thermocouples) measurements will finish by the end of 2015, having with a delay of around 6 months. Two of the participating NMIs, BoM (MK) and IPQ (PT) have asked to withdraw from the comparison because they are not able to perform the measurements and INRiM (IT) has joined. At the moment 16 out of 21 participants have completed their measurements.

#### 4. CMCs

The review of EURAMET CMCs is performed cyclically (yearly) by a team of EURAMET TC-T experts (typically two experts for each group of services), coordinated by the chairman of the WG on CMC review. The date for having cmcs considered is end of Dec the previous year. The chair of the review group is Helen McEvoy of NPL (UK) from 2015 for a four year term.

The following batches of EURAMET-approved CMCs were submitted to CCT WG-CMC (formerly CCT WG-8) for inter-RMO in the last year (to Dec 2014):

EURAMET.T.15.2014

EURAMET.T.16.2014

EURAMET.T.17.2014

The following CMCs were approved by the inter-RMO review and published on the BIPM database:

8 CMCs for standard platinum resistance thermometers (March 2014)

27 CMCs for humidity and 5 CMCs for thermocouples (May 2014)

8 CMCs for radiation thermometry (June 2014)

The following batch of CMCs was submitted for inter-RMO review in February 2015. They are all still being processed.

10 CMCs for humidity including air temperature sensors;

7 CMCs for radiation thermometry;

59 CMCs for (industrial) platinum resistance thermometers, liquid-in-glass thermometers, digital thermometers;

21 CMCs for SPRTs and fixed points;

9 CMCs for thermocouples.

#### 5. Participation in EMRP/EMPIR

The TC-T has a coordinated approach to the EMPIR/EMRP calls. Until 2013 a web-based NPL share-point was used to collect ideas but its use was suspended, due to

lack of use. In 2014/5 two different strategies have been carried out. First the organization of focus groups to study the feasibility of different proposals in the frame of the Pre-Normative call and then second by means of a workshop which was held during the TC-T annual meeting as a forum to discuss possible proposals. There was a lack of interaction with other EURAMET TCs and to mitigate this problem the TC-T has tried to send representatives to all meetings or workshops related to the EMPIR calls, like the Health workshop at VSL or the STAIR-EMPIR kick off meeting, with the objective to present the TC-T priorities and to obtain information about the needs regarding the TC-T topics in the horizontal calls.

In the first Industry EMPIR call the TC-T was involved in the formulation of 10 PRTs of which 4 were selected as SRT which gave rise to 4 JRPs with finally 2 of them selected for funding: EMPRESS (KO meeting May 2015 at NPL) and HIT. Regarding capacity building, the TC-T presented 6 PRTs that were merged into 1 SRT that also gave rise to 1 funded JRP: Eura-Thermal.

A number of PRTs were submitted to the 2015 call and the final result is awaited at the time of preparation of this report.

A number of EMRP projects are still underway such as the Implementing the New Kelvin (SI01) which will be finished in Sep 15. A progress report will be given on the project in the plenary presentation.

## 6. Meetings

The annual TC-T meeting was held in Lisbon, Portugal, hosted by IPQ on 24-27 February 2015. During the annual TC-T meeting the WGs met as did the sub-committee on humidity and moisture. All reported their activities to the TC-T Plenary session.

Two half-day workshops were held in conjunction with the 2015 annual TC-T meeting, one concerned with disseminating the results of the EMRP NOTED project to the TC-T community another more focussed on PRTs for the EMPIR 2015 call.

The TC-T community was very successfully promoted to the wider scientific community through a Royal Society workshop on “Towards implementing the new kelvin” linked to the EMRP InK project held on 18-19 May 2015.

## 8. Strategic planning

The WG on Strategy is in charge of the strategic planning of the TC-T. The following actions were taken in the past year:

- o Wording of the TC-T contribution to the EURAMET strategic agenda.
- o Organization of 3 Pre-normative focus groups on thermal imaging, measurement of contact temperature (by contact sensors) and humidity.
- o Organization of an EMPIR workshop to collect ideas from the EURAMET representatives.
- o Attendance to all meeting/workshops related to the EMPIR calls.

## 9. Outlook for 2015/2016

### Meetings

- The next annual TC-T meeting will be held in Malta on 23-26 February 2016.
- Three TC-T workshops are planned
  - o Roadmapping of TQ at CIM in September 2015

- Surface contact temperature measurement (organised by MKEH) and EMPIR project planning during the TC-T meeting in Malta.
- Planning has begun for Tempmeko '16 in cooperation with IMEKO TC12 (TC-T chair is co-chair of the IPC)

The major objectives for the coming year are:

- EMPIR 2015 Call: prepare JRPs for selected projects
- Preparation for the TC-T 2016 meeting in Malta and three workshops (at CIM and TC-T annual meeting)
- Continue to progress regional SPRT comparison to CCT-K9 and other comparisons in humidity and moisture
- Continue preparing for Tempmeko 16, to be held in Poland in June 2016

Graham Machin  
TC-T chair