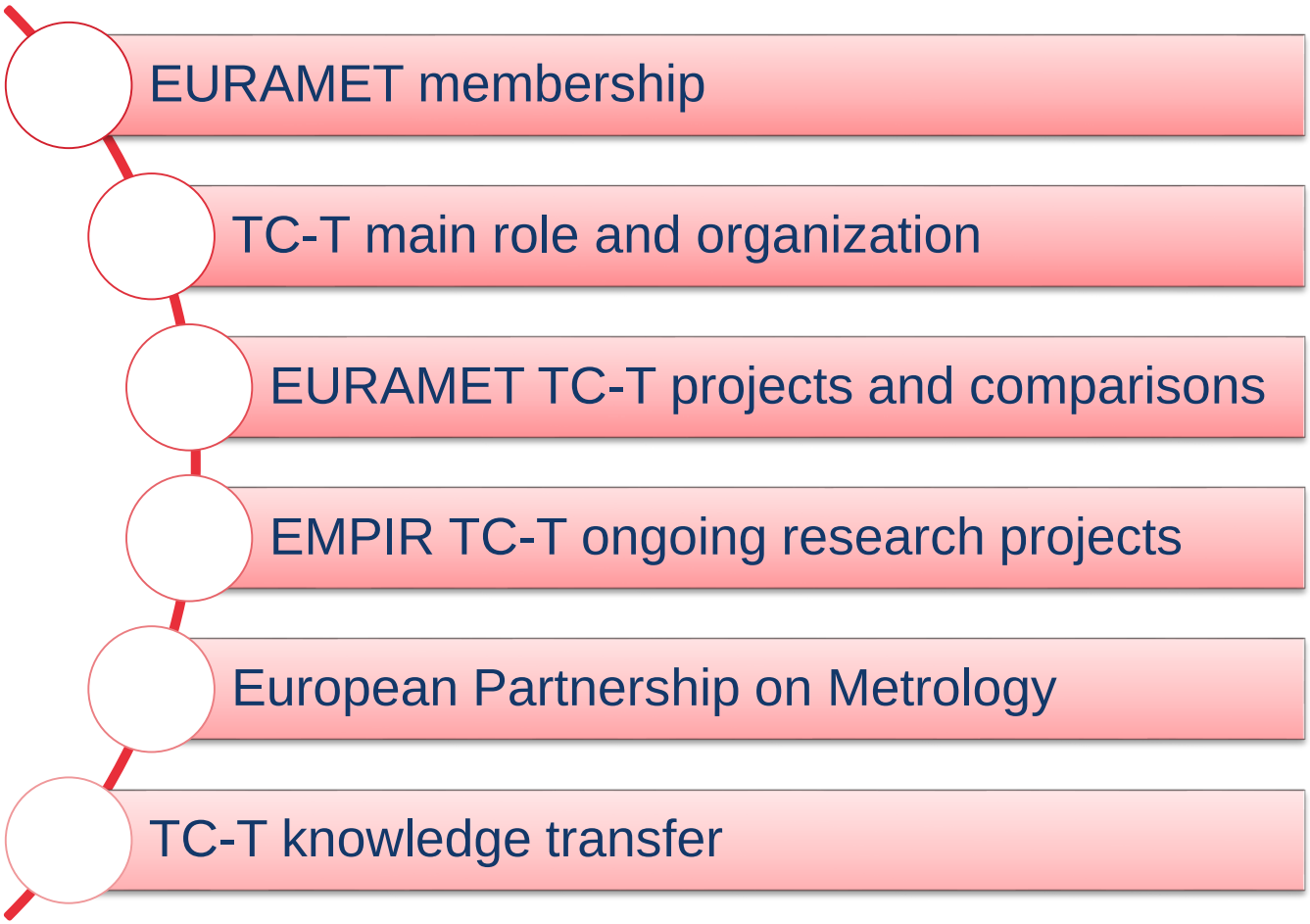
CCT/2022-28

EURAMET TC-T Report

Dolores del Campo
EURAMET TC-T Chair
February 2022

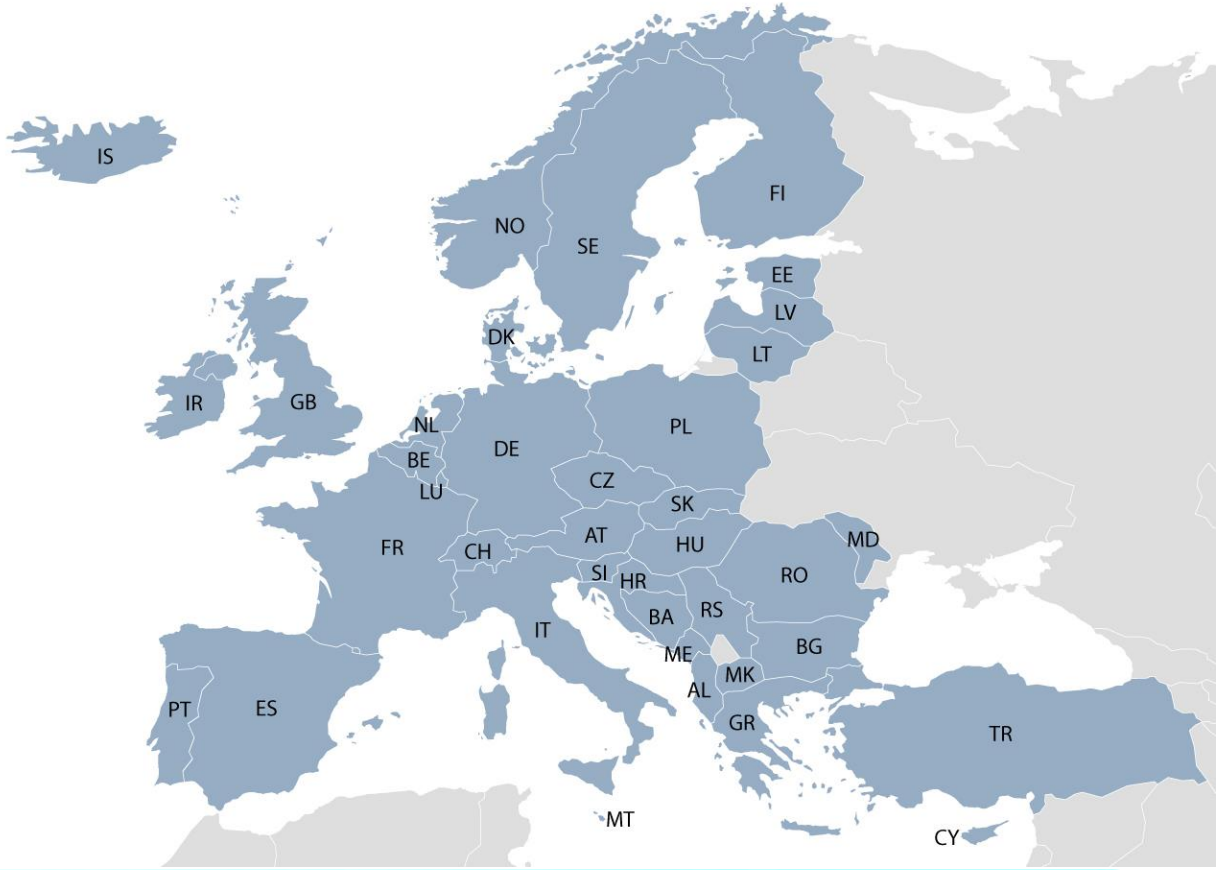
Outline


EURAMET membership
TC-T main role and organization
EURAMET TC-T projects and comparisons
EMPIR TC-T ongoing research projects
European Partnership on Metrology
TC-T knowledge transfer

EURAMET Membership

Members
38 NMIs

Associates
77 DIs



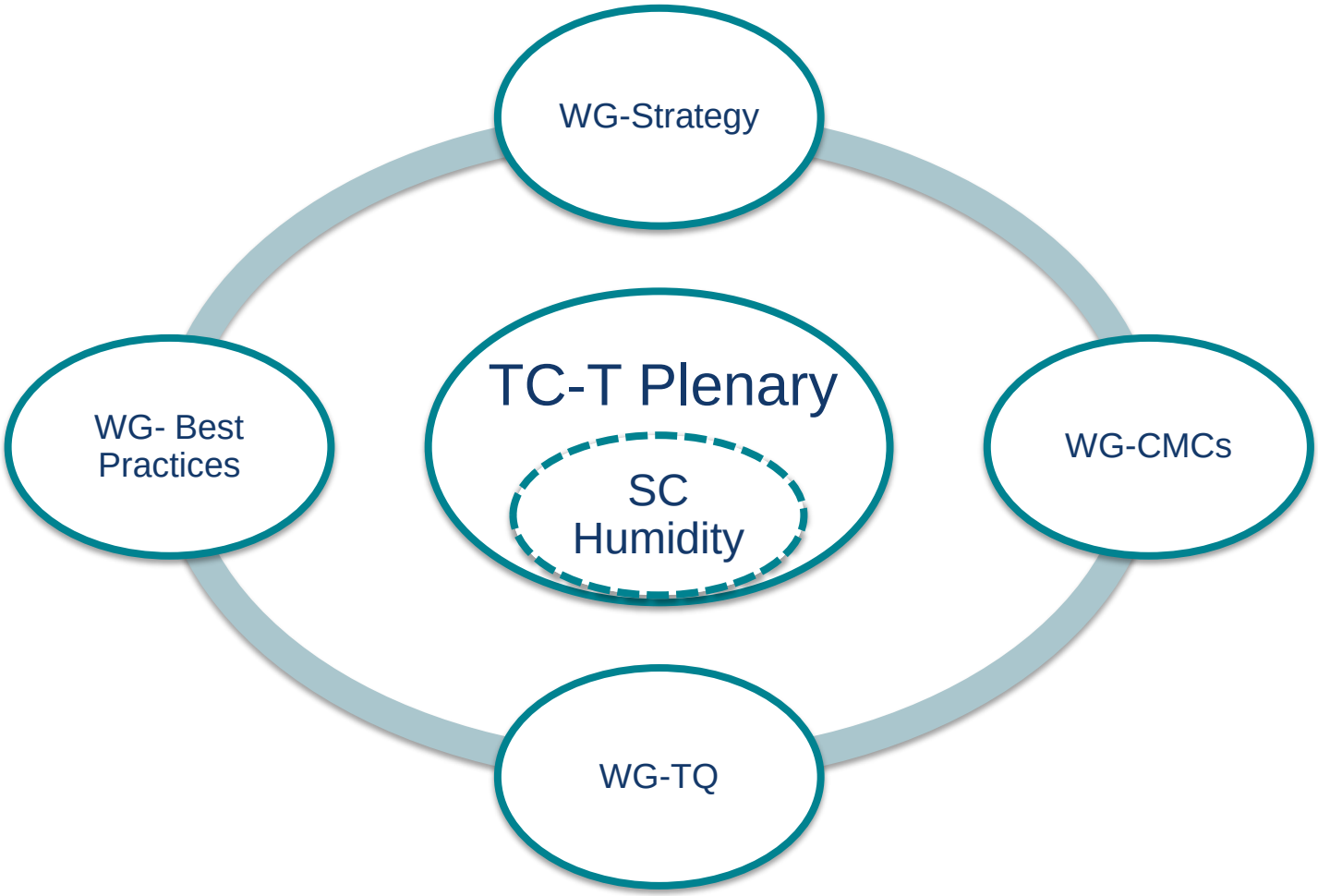
TC-T Line of action

The Technical Committee of Thermometry is concerned with all issues of measurement of

- temperature,
- humidity and moisture, and
- thermophysical quantities of materials
- as well as with scales, standards and reference materials necessary for metrology in these fields.

Thermometry

TC-T Structure

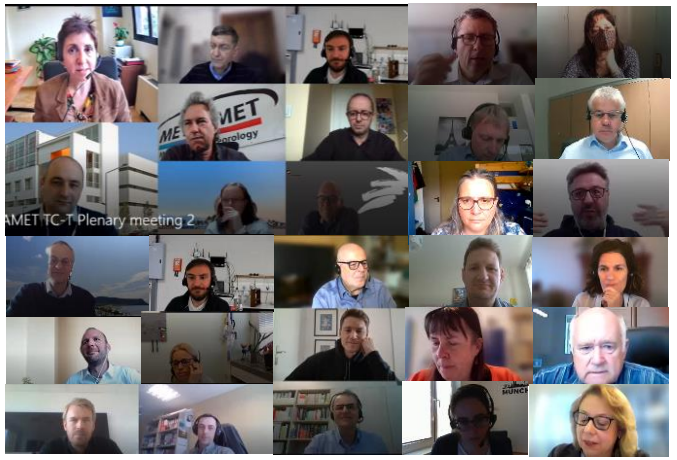


TC-T Plenary

The TC-T is the **forum for scientific and technical cooperation** in the field of thermometry and related quantities. We contribute to the **elaboration and execution** of the Metrology Research Programmes and we are **responsible for the execution of the activities** required by EURAMET as the European Regional Metrology Organisation (RMO) for the fulfilment of the requirements of the CIPM MRA.

2021 Meeting, on-line 26th-29th April

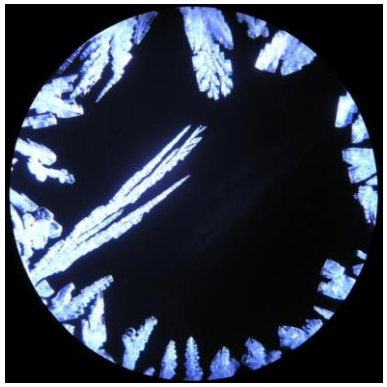
- **Joint meeting with COOMET**
- Workshop on comparisons open to all RMOs (+100 attendees)
- WG meetings: averaging 25 attendees per meeting (including observers and invitees)
- SC-H and TC-T: +70 attendees
- **Next chair elected: Steffen Rudtsch (PTB)**



SC-Humidity

SC-H new chair **Domen Hudoklin** (MIRS/UL-FE/LMK).

The SC-H is concerned with all issues of measurement of humidity and moisture, as well as with standards and references necessary for developing the metrology in the field:



- It disseminates information about the member NMI initiatives and research;
- It promotes collaborations and comparisons in humidity (and moisture);
- It contributes to EURAMET and CCT strategy (via CCT/WG-Hu).

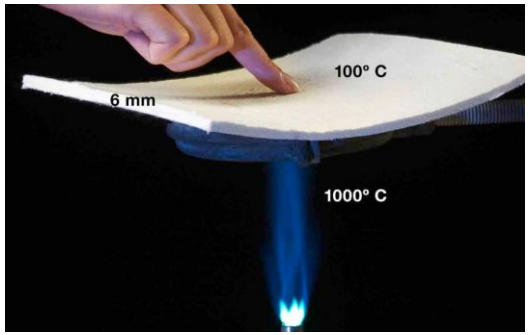
WG-Thermophysical Quantities

The WG-TQ is chaired by **Bruno Hay** (LNE) with **Peter Pavlasek** (SMU) as vice-chair.

This working group is focused on studying **issues of measurement of thermophysical quantities of materials** (TQM).

Its outcomes are used to enhance and support needs and developments of industry and society.

This goal is achieved through mobilizing the TQM community, targeting and completing gaps of the research programs, building capacities, and disseminating scientific knowledge.



WG-Best Practices

The WG-BP is chaired by **Miruna Dobre** (SMD).

The purpose of the group is to **transfer knowledge** within the EURAMET member institutes, to accredited calibration laboratories and beyond.

The WG-BP monitors the current status of existing **guidelines** and other best practice documents and identifies needs for new ones. When technically necessary existing documents are updated, new documents are proposed and prepared.

The WG-BP **monitors needs for training** of NMI personnel and stakeholders. When needed, training courses or training programmes are initiated. The WG identifies needs for capacity building among the Euramet NMI TCT community, in coordination with the TCT WG Strategy.

WG-CMCs

The WG-CMCs is chaired by **Dolores del Campo.**

The aims and purpose of this working group are to provide **input into the CCT WG-CMC** for the development of protocols defining the procedure and technical criteria by which temperature, humidity and thermophysical quantity CMCs are reviewed. Use the agreed protocols **to perform reviews of temperature, humidity and thermophysical quantity CMCs** to verify that claimed values are realistic and to ensure consistency between laboratories.

To **validate** temperature, humidity and thermophysical quantity **CMCs from other RMOs** to ensure consistency of the claimed values between the different metrology regions. To ensure that approved CMCs are published on the KCDB.

WG-Strategy

The WG-Strategy is chaired by **Steffen Rudtsch.**

The role of the TC-T strategy working group is to put in place the necessary structures, foster collaborations and research to ensure that the EURAMET TC-T continually meets its objective in a timely manner.

- Preparing recommendations for TC-T plenary
- Generation and updating of roadmaps
- Identifying and recommending capability development and research priorities
- Encouragement of collaborative projects
- Recommend to TC-T appropriate regional KCs in support of CMCs
- Linkage with CCT Strategy Group and EURAMET TC-T.
- Strengthening the links with key users and stakeholders

TC-T Comparisons

There are several running and recently finished comparisons at CCT (coordinated by EURAMET members) and regional level that involve most of the EURAMET members:

CCT.K8: Comparison of realizations of local scales of dew-point temperature of humid gas .Data treatment and DoE are already calculated, wording of the Draft A to be completed, it will be circulating within the participants within the first trimester of 2022.

CCT.K10: Realization of the ITS-90 between 960 ºC and 3000 ºC. Final report under CCT-KC-WG evaluation.

EUROMET.T-K8 (project 717): Comparison in dew-point temperature (high range). New version of draft A under preparation, it will be distributed within the participants along 2022 in order to have ready Draft B by the end of 2022.

EURAMET.T-K9 (project 1318): Calibration of SPRTs from the Ar TP to the Zn FP. Preliminary Draft A (blinded results) already sent to the participants with 25th February as deadline for comments .

TC-T Comparisons

CCT-S3: Supplementary comparison on thermal diffusivity measurements of isotropic graphite using laser flash method. First version of Draft B submitted for review to the WG-KC of CCT in November 2020.

EURAMET project 1352: Comparison of the realisations of the relative humidity (RH) in the range from 10 %rh to 95 %rh at temperatures from -40 °C to +1 °C. This comparison is behind schedule due to re-organisation problems of the coordinator. .

EURAMET project 1189: Comparison of the realisations of the relative humidity in the range from 10 %rh to 95 %rh at temperatures from -10 °C to 70 °C. Final report published in the EURAMET website.

Other relevant TC-T projects

ATM
Air Temperature Metrology

Project 1459: Air Temperature Metrology

This EURAMET project, coordinated by Andrea Merlone (INRIM), includes two main activities:

- Perform a pilot study (in the form of an interlaboratory comparison) to explore issues around calibration in air of temperature sensors;
- Feed into a EURAMET calibration guide the findings from the pilot study.

The output of this project will provide best practice which is currently lacking. This proposal is also expected to bring valuable input to **WMO**, for the definition of best practice and sustained performance classification, **GCOS task team on Global Surface Reference Network,** for inclusion in the requirements of reference grade air temperature measurements and **GRUAN,** for the general aim at documented traceability for radiosondes temperature profiles.

The pilot study has been concluded, the results are being studied.

Other relevant TC-T projects

Project 1516: Determination of thermophysical quantities measurement capabilities beyond EURAMET

The project, coordinated by Peter Pavlasek (SMU), started offically in December 2020. It has as main objective to create a common database of laboratories and institutes outside the EURAMET community that have the capabilities to measure thermophysical properties. This database will include as much relevant information (for example measurement range and measurement uncertainty) as possible.

The project will intend to reach a wide range of potential future research partners, not only restricted to the EURAMET area.

This database will be freely available to all EURAMET Members and Associates (Designated Institutes) and will enable more collaboration, knowledge transfer and potential research activities in the field of metrology dedicated to thermophysical properties.

EMPIR research projects

Research projects on fundamental and primary thermometry

RealK, coordinated by Graham Machin (NPL) started in 2019. The overall goal of this project is to take the kelvin redefinition (and the MeP-K-19) and begin to turn it into a reality.

PhotOQuanT

PhotOQuant, coordinated by Stéphan Briaudeau (LNE-Cnam) started in 2018 finished in 2021. It aims at developing photonic and optomechanical sensors for realising future quantum and nanoscaled temperature standards. A final workshop was held in January 2022

EMPIR EURAMET
The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

EMPIR research projects

Research projects on energy and industry

BIOFMET, coordinated by Jan Nielsen (DTI) started in 2020 with the objective to develop faster, more accurate, reproducible and traceable methods for measuring solid and liquid biofuel calorific value.

Met4FoF, coordinated by Sascha Eichstädt (PTB) started in 2018 and finished in 2021 aiming at building calibration capabilities for advanced, digital-only industrial sensors and sensor network.

EMPRESS2, coordinated by Jon Pearce (NPL) started in 2018 and finished in 2021. This project objective was to improve the accuracy of a range of thermometers used in manufacturing and the validation of in-situ reference standards

MetForTC, coordinated by Narcisa Arifovic (TUBITAK UME) started in 2019. The project is developing practical methods and devices traceable to the ITS-90 to enable thermocouple drift to be checked in-situ.

EMPIR EURAMET
The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

EMPIR research projects

Research projects on energy and industry

DynPT
Development of measurement and calibration techniques for dynamic pressures and temperatures

DynPT, coordinated by Richard Högström (MIKES) started in 2018 and finished in 2021. It aimed at developing traceable calibration methods for dynamic pressure and temperature sensors for use within industrial settings.

HiTrace, coordinated by Bruno Hay (LNE) started in 2018 and finished in 2021. Its objective was to establish new methods for characterising the thermophysical properties of any solid material up to 3000 ° C, and launch a network of reference facilities and materials available to industry.

Hi-TRACE

PROMETH2O, coordinated by Vito Fernicola (INRIM) started in 2021. The project will develop a range of optical methods, including for gases other than nitrogen, down to 5 ppb, a primary method to measure amount fractions down to 50 ppb, and validate chilled-mirror hygrometers down to -105 ºC.

EMPIR EURAMET
The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

EMPIR research projects

Research projects on environment

INCIPIT , coordinated by Andrea Merlone (INRIM) started in 2019 aiming at developing metrological traceability and calibration methods for non-catching rain gauges.

SimpleMeteoU, coordinated by Stephanie Bell (NPL) started in 2018 and finished in 2021. This project has developed a system for the simplified expression of uncertainty in meteorological data, combined with user-friendly graphical representation.

CRS, coordinated by Andrea Merlone (INRIM) started in 2020. The project will develop 'reference climatological stations' with metrologically validated instruments.

COAT, coordinated by Carmen García (CEM) started in 2020. The project will contribute to increase the comparability of extreme air temperature measurements for meteorology and climate.

The European Partnership on Metrology

This **new programme started in 2021** aiming at creating, by 2030, a sustainable and effective system for metrology at European level that ensures Europe has a world-class metrology system that:

- Provides metrology solutions, fundamental metrological reference data and methods, offering fit-for-purpose solutions supporting and stimulating European innovation and responding to societal challenges.
- Supports and enables effective design and implementation of regulation and standards that underpin public policies that address societal challenges.

7 years Duration / 600 M€ budget

TC-T Publications

Guides in preparation

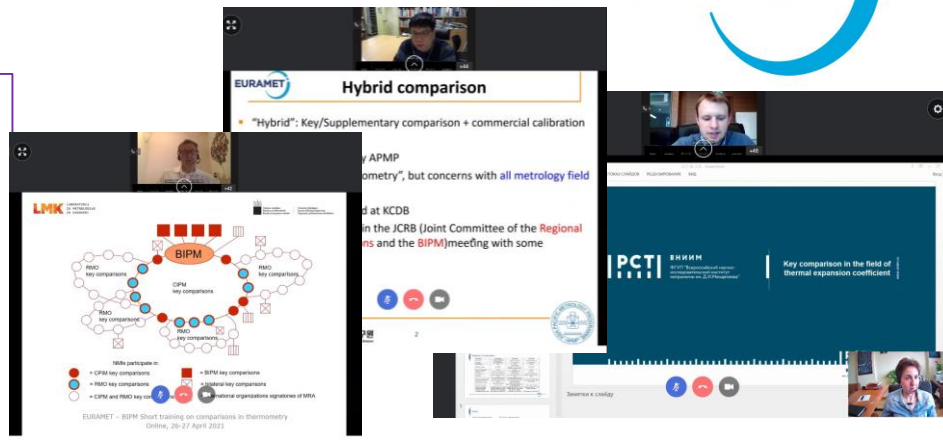
- Guide on **surface temperature calibrations,** works coordinated by Søren Lindholt Andersen (DTI). Developed jointly with COOMET.
- Guide on the calibration of **radiation thermometers**, works coordinated by Dubhaltach MacLochlainn (NSAI). Developed jointly with COOMET.
- Guide on **dew point calibrations,** works coordinated by Seda Oguz Aytekin (TUBITAK UME)
- Guide on **relative humidity calibrations**, works coordinated by Eric Georgin (CETIAT).
- Guide on **Thermal diffusivity** calibrations, works coordinated by Bruno Hay (LNE)

… Inputs from other RMOs are welcomed!




TC-T Training

On line training on comparisons in thermometry, in collaboration with BIPM.
(2x2) hour sessions 26th and 27th April 2021.
Speakers from different RMOs
+80 attendees.



Training on CMCs preparation and submission aiming at homogenise the interpretation of the CCT review protocols.
(2x2) hour sessions 25th and 26th April 2022.
Agenda on elaboration. We plan to count on speakers from different RMOs.

… and Thermometry Summer School in 2023 in Ljubljana hosted by MIRS/UL-FE/LMK and open to all RMOs.


THANKS FOR YOUR ATTENTION