

Title: Developing traceable capabilities in thermal metrology

Abstract

Temperature is one of the most commonly measured parameters, particularly in industry for controlling and monitoring processes and for improving energy and process efficiency. The EURAMET TC-T has identified a number of temperature related areas, driven by specific traceability requirements to support industrial, testing and other needs, where capacity building would be beneficial.

This topic is focused on enhancing the availability of facilities for the measurement of high temperatures, non-contact thermometry at lower temperatures and thermophysical properties and also the research capability at NMIs/DIs within countries or regions in Europe where access to these types of facilities is currently limited.

Keywords

High temperatures, contact thermometry, non-contact thermometry, thermophysical properties, capacity building

Background to the Metrological Challenges

Several topics linked to temperature and temperature related quantities, in which there is a need for capacity building driven by specific traceability requirements at different levels of accuracy and ranges necessary to support industrial, testing and other needs in the countries concerned, have been identified by the EURAMET TC-T. There are two topics directly related to temperature linked to industrial development (for example metal, glass, ceramic production) and efficiency in which there is a real need for capacity building. These are high temperature measurements (including contact and non-contact thermometry) and non-contact thermometry at lower temperatures. The third topic, the development of scientific and calibration capabilities for thermophysical properties, is broad and impossible to be fully covered by a single NMI. Moreover, thermophysical properties play a key role in the development and production of complex materials and the development of advanced industrial technologies such as highly integrated electrical devices, optical discs, magneto-optical discs and thermoelectric devices.

An NMI or DI wishing to establish a research capacity in this area would do so through the design, construction and validation of their own temperature related metrology facilities. The design would build on the experience of more developed NMIs, using their expertise to optimise the design for the particular needs of that country. The validation process would involve the NMI establishing the capability participating in comparisons and analysis of uncertainties with others establishing similar facilities and those with long established facilities. The whole process would result in both the development of a facility, the development of the relevant staff and the development of relationships between the establishing NMI and more experienced researchers in the field which would foster further joint research activities beyond the life of the project.

Objectives

Proposers should address the objectives stated below, which are based on the PRT submissions. Proposers may identify amendments to the objectives or choose to address a subset of them in order to maximise the overall impact, or address budgetary or scientific / technical constraints, but the reasons for this should be clearly stated in the proposal.

The JRP shall focus on the coordinated development of regional metrological capacity in thermal metrology. The proposed work should include a review of existing capabilities and needs in the region, validation of existing systems and, if the review reveals a lack at regional level, development of new systems.

The specific objectives are

1. To develop traceable measurement capabilities in **contact high temperature measurements** in the range between 960 °C and 1084 °C for those participating NMIs and DIs seeking to establish a research capability in this field.
2. To develop traceable measurement capabilities in **non-contact thermometry** in the range from 300 °C to the 2000 °C for those participating NMIs and DIs seeking to establish a research capability in this field.
3. To develop traceable measurement capabilities in the field of thermophysical properties. Due to the diversity of this field proposers should identify the parameters they will target and provide an explanation of the reasons for their selection.
4. For each emerging NMI participant, to develop an individual strategy for the long-term development of their research capability in thermal measurements including priorities for collaborations with the research community in their country, the establishment of appropriate quality schemes and accreditation (e.g. participation in key comparisons, the entry of CMCs into the BIPM database, accreditation to ISO/IEC 17025). They should also develop a strategy for offering calibration services from the established facilities to their own country and neighbouring countries. The individual strategies should be discussed within the consortium and with other EURAMET NMIs/DIs, to ensure that a coordinated and optimised approach to the development of traceability in this field is developed for Europe as a whole.

Proposers shall give priority to work that meets documented metrological needs and activities that will lead to an improvement in European metrological capability and infrastructure beyond the lifetime of the project.

Proposers should establish the relevant current capability for research, and explain how their proposed project will develop capability beyond this.

EURAMET has defined an upper limit of 500 k€ for the EU Contribution to any project in this TP, and a minimum of 100 k€

EURAMET also expects the EU Contribution to the external funded partners to not exceed 10 % of the total EU Contribution to the project. Any deviation from this must be justified.

Potential Impact

Proposals must demonstrate adequate and appropriate participation/links to the “end user” community, describing how the project partners will engage with relevant communities during the project to facilitate knowledge transfer and accelerate the uptake of project outputs. Evidence of support from the “end user” community (e.g. letters of support) is also encouraged.

You should detail how your JRP results are going to:

- provide a lasting improvement in thermal metrological regional capability and infrastructure beyond the lifetime of the project;
- improve the efficiency of use of available resources through knowledge transfer, cooperation in research, shared facilities, etc.;
- facilitate improved industrial capability in the country and region and/or improved quality of life for European citizens in terms of personal health or protection of the environment;
- facilitate further participation of emerging NMIs in future national and international research projects.

You should detail other impacts of your proposed JRP as specified in the document “Guide 4: Writing Joint Research Projects”.

You should also detail how your approach to realising the objectives will further the aim of EMPIR to develop a coherent approach at the European level in the field of metrology and include the best available contributions from across the metrology community. Specifically the opportunities for:

- improvement of the efficiency of use of available resources to better meet metrological needs and to assure the traceability of national standards
- the metrology capacity of EURAMET Member States whose metrology programmes are at an early stage of development to be increased
- organisations other than NMIs and DIs to be involved in the work

Time-scale

The project should be of up to 3 years duration.