

## **Title: Expansion of research capabilities in humidity and moisture measurement 2**

### **Abstract**

Research is required to enable the further development of metrological infrastructure and research capacity within the field of humidity and moisture measurements to support enhanced process efficiency and improved product quality in industry. A joint humidity metrology network could develop and disseminate practical methods for humidity and moisture measurements to end users. Particular focus is needed on the measurement of moisture in materials, using the outputs of EMRP project SIB64 METefnet and EMPIR project 15RPT03 HUMEA, which focused on the development of research capabilities in humidity measurement.

### **Keywords**

Humidity, dew-point temperature, relative humidity, moisture in materials, measurement traceability

### **Background to the Metrological Challenges**

The EMPIR project 15RPT03 HUMEA focused on the development of research capabilities in humidity measurement through the design and testing of an inner chamber for calibration of relative humidity instruments. The results clearly indicated improvements in uncertainties for the calibration of relative humidity instruments, especially when the inner chamber is used in combination with climatic chambers of larger working volume that are usually present at stakeholder laboratories. However, during the inner chamber testing, the project partners came up with several possible modifications and proposed a new design that could further improve the calibration uncertainties and decrease the chamber stabilisation period for the laboratories working on the primary level, having at their disposal the primary dew-point generators and state of the art climatic chambers of small working volume.

Further development of metrological infrastructure and capacity within humidity and moisture measurement is now required to support enhanced process efficiency and improved product quality in industry. A joint distributed humidity metrology network would support the dissemination of practical methods for humidity and moisture measurements. In particular, this should focus on measurement of moisture in materials, since laboratories from emerging countries continuously receive requests for these kinds of measurements from the construction building (e.g. restoration of old historical buildings, research on advanced thermal management methods to increase human thermal comfort in smart buildings), wood processing and pharmaceutical industries. Such methods were developed in the EMRP project SIB64 METefnet, which opened up a new, feasible way to control the quality of moisture measurements in industrial laboratories through appropriate traceability chains. Many of the project's outcomes are suitable for extension to wider classes of materials and applications.

### **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 protocol.

The JRP shall focus on the development of metrological capacity in humidity and moisture measurements.

The specific objectives are

1. To set up a joint humidity metrology network to transfer knowledge and expertise in the construction and improvement of dew point generators and inner chamber design developed in EMPIR project

15RPT03 HUMEA and to improve the calibration system in order to provide better service to local customers.

2. To build on the outputs of EMRP project SIB64 METefnet by developing calibration procedures and instrumentation to perform SI-traceable measurements of moisture in solid materials (e.g. wood, paper), by applying different techniques (e.g. gravimetric methods, cKF). The procedures and set-ups to be validated by intercomparison.
3. To extend the applicability of SI-traceable moisture measurement and calibration methods to soil and/or liquid samples and to compare each method against documentary standard methods relevant to the material concerned.
4. To monitor and report on the operations and developments of NMIs in accordance with the strategy documents written in 15RPT03 HUMEA.
5. For each participant, to develop an individual strategy for the long-term operation of the capacity developed in this project, including regulatory support, research collaborations, quality schemes and accreditation. 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 including members of relevant the EMNs or JRPs, to ensure that a coordinated and optimised approach to the development of traceability in this field is developed for Europe as a whole.

Joint Research Proposals submitted against this SRT should identify

- the JRP(s) or/and the joint European metrology structure initiative they refer to,
- the particular metrology needs of stakeholders in the region,
- the research capabilities that should be developed (as clear technical objectives),
- the impact this will have on the industrial competitiveness and societal needs of the region,
- how the research capability will be sustained and further developed after the project ends.

The development of the research potential should be to a level that would enable participation in other TPs or European Metrology Networks.

Proposers should note that the programme funds the activity of researchers to develop the capability, not the required infrastructure and capital equipment, which must be provided from other sources.

EURAMET has defined an upper limit of 0.5 M€ for the EU Contribution to any project in this TP, and a minimum of 0.1 M€

EURAMET also expects the EU Contribution to the external funded partners to not exceed 10 % of the total EU Contribution across all selected projects in this TP.

## 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:

- Address the SRT objectives and deliver solutions to the documented needs,
- Provide a lasting improvement in the European metrological capability and infrastructure beyond the lifetime of the project, including the related JRP or EMN as applicable,
- Facilitate improved industrial capability or improved quality of life for European citizens in terms of personal health or protection of the environment,
- Transfer knowledge to the manufacturing sector and the metrology community.

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

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.