EMPIR Call 2016 – Energy, Environment, Normative and Research Potential

Selected Research Topic number: **SRT-r01**
Version: 1.0

Title: Development of scientific and technical capabilities in the field of chemical analysis

Abstract

Determining the level and species of pollutants in water, soil or sediments or the contaminants in food requires analysis of the various analytes in samples. In order to underpin environmental monitoring and food safety, there is a need to improve the reliability of chemical analysis measurements in some countries by developing and improving the scientific and technical capabilities in the field of inorganic analysis and pH measurements.

Keywords

Capacity building, inorganic analysis (IA), IDMS (Isotope Dilution Mass Spectrometry), total element determination, pH secondary method, proficiency testing (PT), reference materials, interlaboratory comparisons, environmental monitoring, food analysis

Background to the Metrological Challenges

Reliable chemical analysis is important to underpin environmental monitoring and food safety and hence consumer protection. The European Water Framework Directive (WFD) came into force in 2000 with a staged implementation of the key milestones, and from 2015 EU Member States have been required to meet the environmental objectives. Field laboratories for water analyses have to demonstrate their capabilities to meet the WFD requirements in terms of a low limit of quantification (LOQ), which is often lower than ng/kg. In the field of food analysis, the determination of contaminants such as toxic elements is essential in order to ensure food safety and consumer confidence.

In the field of metrology in chemistry, the most accurate analytical approach requires the application of Isotope dilution mass spectrometry (IDMS), which is recognised as a primary measurement procedure for elemental analysis. IDMS methodology is currently applied in the most experienced NMIs, however this capability is not currently available in many less experienced or emerging NMIs/DIs. pH capability is also required for some physicochemical parameters. In addition accredited laboratories undertaking chemical analysis, such as the determination of different elements in potable, waste and surface water, sediments, food, etc, need to demonstrate their competence through periodic participation in interlaboratory comparisons (ILCs) or proficiency testing (PT) schemes. This can prove challenging due to a lack of both suitable ILCs and PT schemes and also appropriate certified reference materials/matrices within some regions.

NMIs/DIs in a number of countries therefore need to develop research capability in the fields of inorganic analysis and pH measurement in order to directly undertake high level chemical analysis and also to support the needs of chemical analysis laboratories through the provision of traceability, CRMs, ILCs and PTs.

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 chemical analysis for environmental monitoring and food analysis.

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The specific objectives are

1. To develop traceable measurement capabilities in inorganic analysis for concentrations lower than ng/kg with uncertainties of few % by developing isotope dilution mass spectrometry as a primary procedure for element determination.
2. To develop a secondary method for pH measurement, and to apply the method for the production and characterisation of reference pH buffer solutions for use for the calibration of pH-meters and as reference samples for interlaboratory comparisons and proficiency testing.
3. To apply the methods developed to environmental and food samples to determine the heavy metals content in potable, waste and surface waters, sediments, soils, different types of biota, and a range of food matrices.
4. To validate the methods developed by participation in suitable international comparisons (organised by CCQM, EURAMET, another RMO, and/or bilateral – between the NMIs participating in the project) and hence to underpin the development of appropriate CMCs (Calibration and Measurement Capabilities) for submission to the BIPM Key Comparison Database.
5. For each participant, to develop an individual strategy for the long-term operation of the capacity developed, 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, 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 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 competiveness 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.

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 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.

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,
- 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 environmental monitoring and food safety sectors, 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.