Potential European Partnership on Metrology
Call 2021 – Green Deal and Normative

Selected Research Topic number: **SRT-v03**
Version: 1.1

Important information about these documents

This call is being held ahead of any agreement from the Commission that the relevant funding will be available. At present the relevant legislation is still under discussion in both Council and Parliament, and there is no certainty on the detailed arrangements for funding selected projects. The funding of any selected project, and the terms and conditions of participation in the projects, are dependent on completion of the legislative process and the subsequent contractual processes between the European Commission and EURAMET. Proposers submit to this call at their own risk.

Background

Last year, EURAMET submitted a draft proposal to the EC for a further research programme to be established under article 185 of the Treaty on the Functioning of the European Union (TFEU) to follow on from EMRP and EMPIR. This was published by the EC at https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/european-partnerships-horizon-europe/candidates-digital-industry-and-space_en

The initiative would be called the European Partnership on Metrology and would aim to create, 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.

The Commission commissioned an impact assessment into this proposal and 11 others in similar priority areas, and, based on those findings, published their own proposal for the Partnership, their response to the impact assessment and a draft of the Decision on 23rd February 2021. See:

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:89:FIN

https://ec.europa.eu/commission/presscorner/detail/en/ip_21_702

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021SC0035&qid=1614677899327

That draft Decision is currently under discussion in the European Council and the European Parliament.

Under the assumption that the Council and Parliament pass the basic act which would form the legal basis for this research programme, and that the participating countries named in the Draft Decision submit the required commitment letters, EURAMET is publishing these potential Selected Research Topics and draft guidance notes. These documents are not approved by the Commission nor will they lead to a binding decision by EURAMET e.V. for any further negotiation or funding. All published guides and templates are subject to amendment by the EC and EURAMET e.V. as further information becomes known.

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Title: Metrology for the harmonisation of measurements of environmental pollutants in Europe

Abstract

Improved enforcement of environmental regulations and ultimately achieving the zero-pollution ambition promoted by the European Green Deal requires the development of highly sensitive detection techniques as well as reliable and SI traceable measurements of both radioactive and stable polluting elements in the environment. Mass spectrometry is a key method for the determination of non-radioactive polluting elements and has become of increasing importance for measurements of long-lived radionuclides. Proposals addressing this SRT should bridge the gap between radiometric techniques and mass spectrometry by comparing and linking them, thus significantly improving measurement uncertainties and detection limits. Additionally, they should aim to develop new reference materials for radioactive and stable pollutants that are necessary to establish harmonised and SI-traceable measurement procedures applicable to commonly available mass spectrometers.

Keywords

Pollution monitoring, stable pollutants, radioactive pollutants, metrological traceability, isotope ratio measurements, radiometric measurements, mass spectrometers, mass-spectrometric methods, certified reference materials, detection limits, method validation, radionuclides

Background to the Metrological Challenges

Pollution in air, water and soil is a persistent hazard to human and ecological health. There are significant economic losses associated with pollution, including healthcare costs, lost productivity, reduced agricultural output, costs of remediation and loss of biodiversity. The European Green Deal espouses “a zero-pollution ambition for a toxic-free environment” for which an action plan has been adopted in May 2021. Strengthened implementation and enforcement of environmental regulations is a key mandate in the action plan that will require improved monitoring tools, data sources and models. Achievement of this goal, and ultimately of the zero-pollution ambition, necessitates the development of a robust metrological framework for the detection and measurement of both stable and radioactive pollutants in the environment. In particular, harmonised and SI-traceable mass-spectrometric and radiometric methods are of key importance to assure the consistency and comparability of data provided to the EC and to the national authorities responsible for meeting the targets of the European Green Deal in addition to carrying out other regulatory obligations regarding pollution monitoring.

Fast and inexpensive analytical procedures are needed to detect radioactive and stable polluting elements in the environment, which can be accomplished through better employment of non-radiometric techniques. Despite the increasing application of single collector ICP-MS for measurements, its potential cannot be fully realised unless techniques are validated with traceable multi-element reference materials, which are not commonly available. Even single-element certified reference materials are limited to very few elements. It is thus urgent to develop appropriate SI-traceable certified reference materials to calibrate mass spectrometers to reduce uncertainties and resolve measurement issues such as mass bias effects. Such reference materials are also needed for use in laboratory intercomparisons to test proposed techniques and facilitate harmonization of measurement methods.

Novel methods like mass spectrometry (MS), accelerator MS and ultra-low-level radioactivity counting techniques allow tracing of crucial pollutants (e.g. actinides) in the compartments of the environment even at very low concentration levels, enabling the quantitative assessment of contamination levels where previously there may have been “zero results” (i.e. below the detection limits). However, these novel methods need to be compared and harmonised on the European scale.

Further improvements in measurement of radioactive pollutants to deliver lower uncertainties and detection limits may be achieved though harnessing the synergetic effects of an interdisciplinary approach using different methods, e.g. using alpha-particle spectrometry of samples followed by the subsequent analysis of long-lived radionuclides by mass spectrometry (e.g. AMS, SIMS, SNMS) or ultra-low-level gamma-ray spectrometry. This will also enable the sensitive detection of both long- and short-lived isotopes of the same element in the same sample.

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 and harmonisation of measurement methods for the characterisation and detection of polluting elements and element tracers.

The specific objectives are

1. To establish and compare the selectivity and detection limits of different types of mass spectrometers (e.g. AMS, HR-ICP-MS, ICP-MS/MS, ICP-QMS, MC-ICP-MS, SIMS, SNMS, TIMS) for selected radioactive pollutants (e.g. U, Np, Pu, Am) using isotope reference materials and/or activity standards. This includes assessing relative instrument performance with respect to current measurement challenges and establishing detection limits in relation to regulatory waste criteria levels or environmental regulations.
2. To develop measurement methods for isotope ratios that are traceable to the SI by using multi-collector ICP-MS and apply these methods on more commonly available techniques (ICP-MS/MS, ICP-QMS) by providing suitable operating procedures focussing on stable polluting elements (e.g. Li, B, Cr, Cd, Sb, Pb, U). To produce recommendations for sample processing, treatment, uncertainty budgets, and if feasible, the quantification of the so-called mass bias.
3. To develop at least one radioactive reference material with the sample matrix containing radioactive pollutants (e.g. U, Np, Pu, Am) for use in an inter-laboratory comparison employing techniques used in objective one, which will demonstrate the variations in parameters including detection limits, sample preparation requirements, sample introduction methods, total procedural time, and uncertainty budgets.
4. To implement and validate the methods for isotope ratio measurements established in objective 2 by the development of one aqueous certified reference material (CRM) that is certified for the same stable polluting elements with lowest possible uncertainties using multi-collector instruments, in order to facilitate the calibration of single collector ICP-MS, instrument validation, as well as quality control.
5. To facilitate the take up of the technology and measurement infrastructure developed in the project by the measurement supply chain (e.g. accredited laboratories), standards developing organisations and international organisations (JRC, CIPM CCs [CCQM-IRWG, CCQM-IAWG, CCRI], IAEA, ICRM) and end users (e.g. environmental monitoring agencies).

These objectives will require large-scale approaches that are beyond the capabilities of single National Metrology Institutes and Designated Institutes. To enhance the impact of the research, the involvement of the appropriate user community such as industry, standardisation and regulatory bodies is strongly recommended, both prior to and during methodology development.

Proposers should establish the current state of the art and explain how their proposed project goes beyond this.

EURAMET expects the average EU Contribution for the selected JRPs in this TP to be 2.2 M€ and has defined an upper limit of 2.7 M€ for this project.

EURAMET also expects the EU Contribution to the external funded partners to not exceed 35 % 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,
- Feed into the development of urgent documentary standards through appropriate standards bodies,
- Transfer knowledge to the environmental pollution monitoring sector.

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 the potential European Partnership on Metrology 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.