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

Selected Research Topic number: **SRT-v21**
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.

EURAMET MSU,
Phone: +44 20 8943 6666 Email: EMPIR.msu@euramet.org
msu.euramet.org

Title: Metrology for mobile detection of chemical toxicants and ionising radiation in air in case of severe industrial accidents

Abstract

Following a chemical, radiological, or nuclear event, decision makers require fast, reliable, and traceable data in-order to take key decisions on protecting both the public and the environment. Before first responders can enter stricken buildings and decontamination can commence, remote-controlled preliminary measurements of airborne chemical or radioactive pollutant concentrations and the contaminations source must be established. Obtaining this data in accident conditions can be complicated and dangerous for the monitoring personnel. Therefore, the development of novel, unmanned and autonomous monitoring devices and the underpinning measurement infrastructure that ensures data accuracy is required to aid incident decision makers. Direct cooperation with industrial partners, regulators and standardisation bodies should be anticipated to facilitate the uptake of the technologies developed.

Keywords

Mobile, chemical toxicants, ionising radiation, air, accident, air pollution, artificial intelligence, citizen science, emergency preparedness, environmental monitoring, machine learning, radiation detection, remote sensing, unmanned aerial vehicle (UAV),

Background to the Metrological Challenges

Increasing European industrial competitiveness needs to be interlinked with environmental protection to achieve European Green Deal ambitions of zero-pollution for a toxic-free environment and to preserve ecosystems. The IAEA Safety Standard, 'Preparedness and Response for a Nuclear or Radiological Emergency' (GSR Part 7) emphasises the importance of adequate protective measurements in the aftermath of nuclear and radiological emergencies. Reliable radiological data, available at the earliest possible stage, is a prerequisite to protect people effectively from potentially highly dangerous events. The EU Council Directive 2013/59/EURATOM lays down basic safety standards for protection against dangers arising from exposure to ionising radiation. This research will provide emergency responders with a system that underpins their meeting the requirements given in these documents.

Knowledge of how contamination spreads and the area it covers is essential for accident decision makers who must determine the most appropriate response, the size of any evacuation zone and how best to protect the public. Socio-economic effects can be larger than the direct costs of the incident itself. Radioactive or chemical plumes do not necessarily spread uniformly from their sources, as the Mayak nuclear accident and Bhopal disaster demonstrated. The development of UAV borne measuring systems carrying complex chemical and radiological air monitoring instrumentation, and traceable procedures for their operation, in both routine and emergency environmental monitoring, would provide emergency decision makers with a valuable system for assessing both routine and accidental airborne contamination.

Building on the systems and methods developed for mobile airborne radioactive contamination monitoring developed in EMPIR project 16ENV04 'Preparedness' research is needed to extend these to include airborne chemical pollutant concentration monitoring to create a comprehensive mobile system for emergency use. New traceable standard sources and reference materials require development to provide calibration and measurement traceability. Measurement uncertainties of 20 % or less should be targeted and comparative studies of instrument characterisation and performance should be envisaged. In addition, the potential to use machine learning in data analysis and the incorporation of supplementary data from citizen science pollution monitoring initiatives should be investigated. Research developments are to be complementary to existing static national airborne chemical and European radiological monitoring network capabilities.

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 traceable measurements, using UAV borne monitoring instrumentation for determining chemical and radioactive pollution resulting from facility incident contamination releases. In addition, it shall

investigate methods for the utilisation of supplementary data from citizen science pollution monitoring initiatives into data collected by national monitoring networks.

The specific objectives are

1. To develop unmanned aerial detection systems, and traceable calibration methods for the emergency determination of chemical and radioactive plume pollutant concentrations. The detection systems are to be based on single heavy-duty UAV, and horizontal and vertical swarm of UAVs with a special emphasis on the minimisation of contamination during use.
2. To develop a fully autonomous, AI-controlled UAV for the emergency measurement of chemical and radioactive pollutant releases inside facilities, with the capability of detecting the contamination's source.
3. To improve chemical and radiological incident contamination monitoring by moving aerial detectors, including the use of machine learning in data analysis and the incorporation of supplementary data from citizen science pollution monitoring initiatives. This will require the investigation and development of (i) significant improvements in sensitivity, spatial coverage, and temporal resolution for moving aerial detectors, (ii) advanced data analysis techniques based on machine learning in contamination detection and monitoring, and (iii) methods for the utilisation of supplementary data from citizen science pollution monitoring initiatives. These developments are to be complementary to existing static national airborne chemical and European radiological monitoring network capabilities.
4. To develop new calibration reference materials and/or standard sources for the traceable measurement of airborne chemical and radioactive pollution concentrations for each pollutant that will be detected by the unmanned detection system.
5. To facilitate the take up of the technology and measurement infrastructure developed in the project by the measurement supply chain (manufacturers of instrumentation for emergency preparedness), national regulators, international agencies and committees (e.g. OECD NEA, WHO, WMO), and other international organisations (e.g. CTBTO, FAO, ICAO, IMO, OCHA) and the dissemination of results to the upcoming EMN on Pollution Monitoring who should be a stakeholder in this JRP.

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. In particular, proposers should outline the achievements of the EMPIR project 16ENV04 'Preparedness' and how their proposal will build on these.

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 nuclear and chemical industries sectors.

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.