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

Selected Research Topic number: **SRT-v03**
Version: 1.0

Title: Metrology for Radon Monitoring

Abstract

The European Council Directive 2013/59/EURATOM describes the basic safety standards for protection against the dangers of ionising radiation (EU BSS). This includes a number of requirements regarding the exposure to radon, such as the establishment of reference concentration levels for radon in buildings, the development of action plans for reducing human exposure to radon and the identification of areas where elevated radon concentrations can be expected. However, in order to achieve this, harmonised and traceable methods for radon measurements are needed for European calibration facilities, as well as methods for measuring low radon concentrations, for investigating the influence of thoron influence on radon measurements and the identification of radon priority areas.

Keywords

Indoor Radon, Soil Radon Exhalation, Thoron, Radon priority areas

Background to the Metrological Challenges

The European Council Directive 2013/59/EURATOM evokes new challenges for the metrology of radon measurements, especially the quality assurance of radon monitoring and calibration facilities. As part of the Directive, European member states must consider a strategy for conducting a survey of indoor radon concentrations, which will require reliable radon calibration and measurement methods in the relevant range of activity concentrations (between 100 Bq/m^3 and 300 Bq/m^3). However, only few European facilities currently offer radon activity calibrations, and all of these are only specialised in very high radon activity concentrations (MBq/m^3).

The traceable calibration of radon measuring devices (active and passive monitors) in stable radon atmospheres should be able to achieve uncertainties below 5 %. However, current radon measurements could be overestimated due to the influence of thoron. Existing scientific studies on the influence of thoron are scattered and not used by end users and decision makers. Therefore, there is a need to study this influence in detail and develop appropriate methods to reduce the influence of thoron.

Accurate and consistent results of radon measurements are also necessary to optimise counter measures for reducing of the exposure of the public to radon. The higher the accuracy of the results, the lower the risk of a possible over-response by such counter measures, which will have an important financial impact.

There has also been no effort so far to harmonise the different radon measurement techniques used across Europe. Data harmonisation would give the possibility to combine radon measurements at a European level and develop a consistent measurement framework.

Moreover, EU member states need to define strategies, data and criteria to be used, for the delineation of areas with potentially high radon concentrations. Such strategies should include directly measured indoor radon data, or indirect concepts based on the geogenic radon potential (e.g. based on soil radon exhalation rates).

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.

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The JRP shall focus on the traceable measurement of low radon activity concentrations. It shall contribute to the creation of a coordinated metrological infrastructure for radon monitoring in Europe.

The specific objectives are

1. To develop novel procedures for the traceable calibration of radon (^{222}Rn) measurement instruments at low activity concentrations (100 Bq/m^3 to 300 Bq/m^3) with relative uncertainties ≤ 5 % (k=1). As part of this, to develop new radioactive reference sources with stable and known radon emanation rates.
2. To investigate and to reduce the influence of thoron (^{220}Rn) and its progeny on radon end-user measurements and radon calibrations.
3. To compare existing radon measurement procedures in different European countries and from the results optimise the consistency of indoor radon measurements and soil radon exhalation rate measurements across Europe.
4. To analyse and develop methodologies for the identification of radon priority areas (i.e. areas with high radon concentrations in soil, as defined in the EU BSS) and investigate the relationship between soil radon exhalation rates and indoor radon concentrations.
5. To validate traceability of European radon calibration facilities, and publish guidelines and recommendations on metrologically sound calibration and measurement procedures.

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.

EURAMET expects the average EU Contribution for the selected JRPs in this TP to be 2.0 M€, and has defined an upper limit of 2.3 M€ for this project.

EURAMET also expects the EU Contribution to the external funded partners to not exceed 35 % of the total EU Contribution to the project.

Any industrial partners that will receive significant benefit from the results of the proposed project are expected to be unfunded partners.

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 radiation industry and environmental 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 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.