

MetroRADON project and its potential impact on mitigation practices

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MetroRADON project (duration: 3 years)

- **Joint European project with 17 project partners + 4 collaborators;**
- **Organized in 7 Work Packages (WPs);**
- **Start: 1 June 2017; End: 31 May 2020**

Aim: The aim of this project is to develop reliable techniques and methodologies to enable SI traceable radon activity concentration measurements and calibrations **at low radon concentrations**. The results of the project will be targeted at the implementation of the European Council Directive 2013/59/EURATOM (EU-BSS), one aim of which is to reduce the risk of lung cancer for European citizens due to high radon concentrations in indoor air. The calibration methods and measurement techniques developed in the project will assist the EU member states in the establishment of their national radon action plan, which is required under the EU-BSS.

Structure of the project

WP1: Development of novel procedures for the traceable calibration of radon (^{222}Rn) measurement instruments at low activity concentrations (100 Bq/m³ to 300 Bq/m³) with relative uncertainties $\leq 5\%$ ($k=1$)

WP2: Influence of thoron (^{220}Rn) and its progeny on radon end-user measurements and radon calibrations

WP3: Comparison and harmonisation of radon measurement methodologies in Europe

WP4: Radon priority areas (RPAs) and the development of the concept of a “geogenic radon hazard index” (RHI)

WP5: Validation of traceability of European radon calibration facilities

WP6: Creating impact

WP7: Management and coordination

Steps in solving the radon problem

Identification of the problem
($^{222}\text{Rn} > 100 \div 300$ Bq/m³)

Mitigation

Diagnostics

Construction

Mitigation efficiency assessment
(post-mitigation)



Metro
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Important points related to radon measurements in mitigation practice

- 1. Identification:** Reliable identification of dwellings and working places that should be considered for mitigation (annual average ^{222}Rn concentration $> 100 \div 300 \text{ Bq m}^{-3}$).
Challenge addressed by MetroRADON: Thoron interference of common radon detectors (can result in false alarm).
- 2. Diagnostics:** Measurements before and during the mitigation (identification of sources, routes of entry, radon distribution in the building and soil-gas).
Challenge addressed by MetroRADON: Development and evaluation of new methods for radon measurement in soil-gas, crawlspaces, sumps etc.
- 3. Assessment:** Post-mitigation assessment of the result.
Challenge addressed by MetroRADON: Reliable and metrologically traceable measurements at low radon concentrations, that can prove that the mitigation goal is achieved, i.e. radon level $<$ reference level, ideally \ll reference level.

Reliable identification of dwellings and working places that should be considered for mitigation (annual average ^{222}Rn concentration > reference level) should be based on radon measurements without thoron contribution to the signal.

Thoron interference varies typically in the range of 0.4 % - 74 % for alpha track detectors and in the range of 4 % - 66 % for radon monitors based on ionization chamber or semiconductor detector. Measurements can be corrupted by the thoron interference.

Example: a house with $^{222}\text{Rn} = 75 \pm 19 \text{ Bq m}^{-3}$ and $^{220}\text{Rn} = 3400 \pm 1600 \text{ Bq m}^{-3}$
(Pressyanov D. et al. *Radiat. Meas.* 50 (2013) 218-222)

In this case even 10% thoron interference can result in reporting a false “radon problem” in the house and in wasting of resources for unnecessary (and inefficient) radon mitigation!!!

Thoron issue in MetroRADON

- Ensuring traceability of the secondary thoron reference instruments to the only (so far) primary thoron measurement system at IRSN, France;
- Investigation of the influence of thoron on radon measurements and calibrations (for active and passive radon monitors commonly used in Europe);
- Development of techniques to reduce the influence of thoron on radon measurements and calibrations.

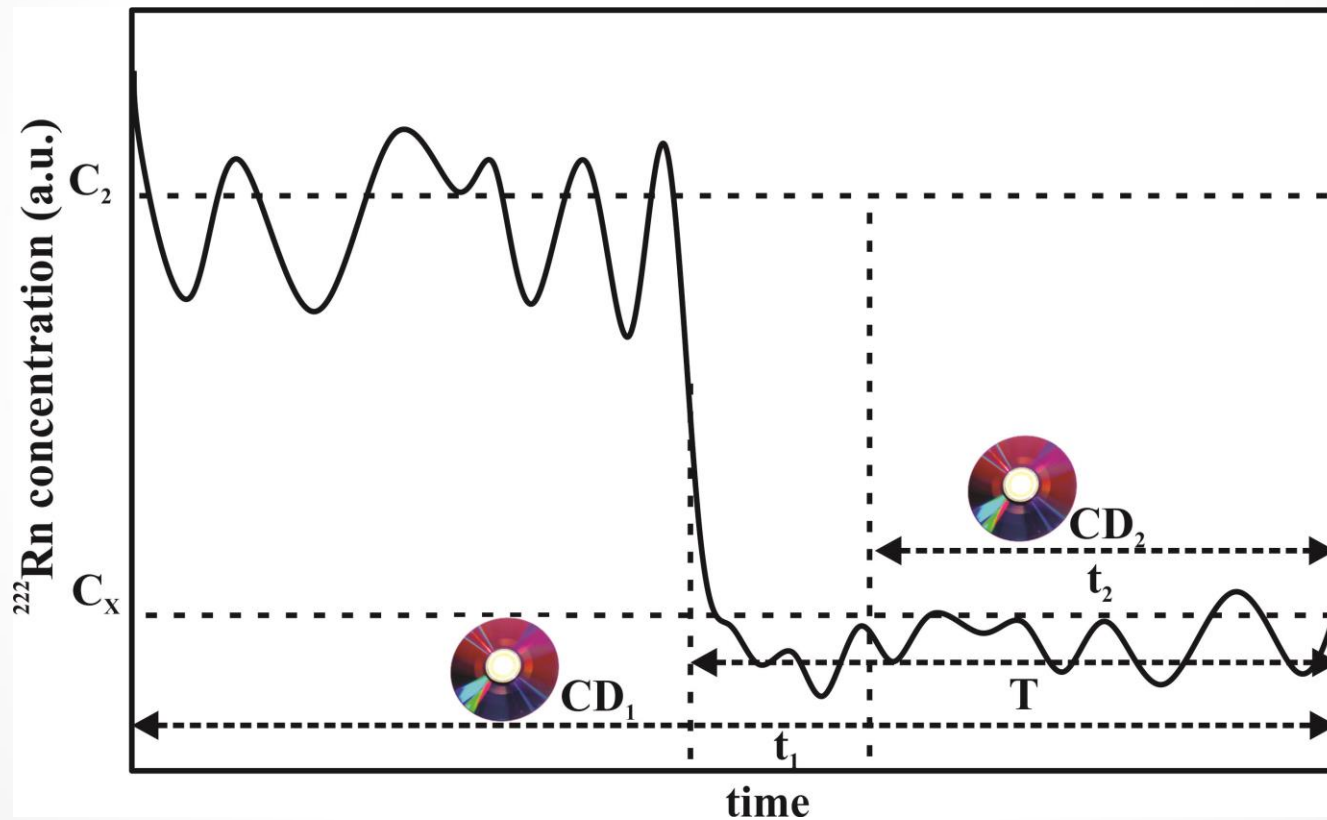
Reliable measurements in the range of 100 to 300 Bq m⁻³ (important for problem identification and the post-mitigation assessment)

- Development of novel procedures for the traceable calibration of radon measurement instruments at low activity concentrations (100 to 300 Bq m⁻³) with relative uncertainties $\leq 5\%$;
- As a result instruments will be tested/calibrated within 100 ÷ 300 Bq m⁻³ range thus ensuring reliability of the results in this range;
- Emphasis on improving the traceability of alpha track detectors.

New techniques that will be developed and evaluated within MetroRADON (scheduled for identification of radon priority areas but usable also for mitigation diagnostics)

- New methods for radon exhalation from soil measurements (radon diagnostics) based on radon absorption in plastics and LSC (Mitev K. et al. *J. Env. Radioact.* (2018), in press);
- Track-etching of CDs/DVDs exposed in air or soil-gas. This method can be employed at any of the 3 steps (identification, diagnostic, post-mitigation measurements).

Example: Application of CD/DVDs for post-mitigation assessment: Two disks of different age can be used to see retrospectively the effect of mitigation (and other building reconstructions - see Pressyanov et al., *J. Env. Radioact.* 143 (2015) 76-79)



One MetroRADON priority is the comparison and harmonisation of radon measurement methodologies in Europe (thus ensuring “quality assured Rn policy”). This includes:

- Existing detectors;
- New detectors;
- Intercomparisons under field conditions in order to identify physical reasons for possible inconsistencies;
- Harmonisation of indoor and geogenic radon data within Europe.

Creating impact: The progress within the project can be followed



Project web-site: <http://metroradon.eu/>

Newsletters are issued twice a year

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Thank you!

Danke!

Merci!

Grazie!