

# Impact and Exploitation of MetroRADON



V. Gruber, on behalf of MetroRADON consortium

MetroRADON Workshop on New procedures for Radon Monitoring, Web-conference, PTB, 12 October 2020

# Workpackage „Creating Impact“

## The aim...

- ☞ To ensure **significant impact** through appropriate **dissemination** and **uptake** of the results and outputs
- ☞ Exchange **knowledge transfer** and feedback between the project partners and **external bodies** (national authorities, policy makers, regulators, industry, standardisation bodies, technical committees, international bodies and associations)
- ☞ 3 main tasks:
  - *Knowledge transfer*
  - *Training*
  - *Uptake and Exploitation*

# MetroRADON Consortium

17 partners from 12 countries



| no. | Participant Type        | Short Name | Organisation legal full name  | Country             |
|-----|-------------------------|------------|---|---------------------|
| 1   | Internal Funded Partner | BEV-PTP    | Physikalisch-Technischer Pruefdienst des Bundesamt fuer Eich- und Vermessungswesen              | Austria             |
| 2   | Internal Funded Partner | BFKH       | Budapest Főváros Kormányhivatala  | Hungary             |
| 3   | Internal Funded Partner | CEA        | Commissariat à l'énergie atomique et aux énergies alternatives                                  | France              |
| 4   | Internal Funded Partner | CMI        | Cesky Metrologický Institut   | Czech Republic      |
| 5   | Internal Funded Partner | IFIN-HH    | Institutul National de Cercetare-Dezvoltare pentru Fizica si Inginerie Nucleara "Horia Hulubei" | Romania             |
| 6   | Internal Funded Partner | PTB        | Physikalisch-Technische Bundesanstalt   | Germany             |
| 7   | Internal Funded Partner | STUK       | Sateilyturvakeskus  | Finland             |
| 8   | Internal Funded Partner | VINS       | Institut Za Nuklearne Nauke Vinca   | Serbia              |
| 9   | External Funded Partner | AGES       | Oesterreichische Agentur fuer Gesundheit und Ernaehrungssicherheit GmbH                         | Austria             |
| 10  | External Funded Partner | BfS        | Bundesamt fuer Strahlenschutz   | Germany             |
| 11  | External Funded Partner | CLOR       | Centralne Laboratorium Ochrony Radiologicznej   | Poland              |
| 12  | External Funded Partner | IRSN       | Institut de Radioprotection et de Surete Nucleaire  | France              |
| 13  | External Funded Partner | JRC        | JRC - Joint Research Centre - European Commission   | European Commission |
| 14  | External Funded Partner | SUBG       | Sofiiski Universitet Sveti Kliment Ohridski   | Bulgaria            |
| 15  | External Funded Partner | SUJCHBO    | Státní ústav jaderné, chemické a biologické ochrany, v.v.i.                                     | Czech Republic      |
| 16  | External Funded Partner | UC         | Universidad De Cantabria  | Spain               |
| 17  | Unfunded Partner        | METAS      | Eidgenössisches Institut für Metrologie METAS   | Switzerland         |



# MetroRADON Consortium

## 9 official collaborators (unfunded)

- ↪ DiMEILA Centro Ricerche INAIL, Italy
- ↪ University of Babes-Bolyai, Romania
- ↪ University Coimbra, Portugal
- ↪ University of Novi Sad, Serbia
- ↪ Istituto Superiore di Sanita (ISS), Italy
- ↪ Slovak Metrology Institute, Slovakia
- ↪ Radonova, Sweden
- ↪ LIFE-Respire project
- ↪ EURADOS



Metro  
RADON



....and many more who gave input to the project!



# The MetroRADON consortium

**Project meetings – around Europe in all seasons**



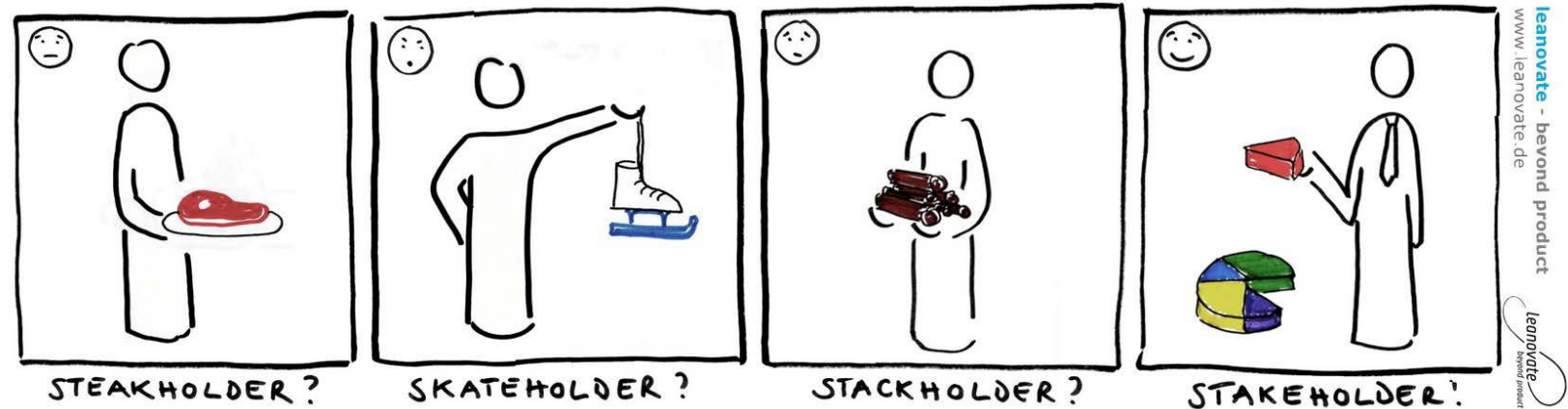
At home, 2020



# Who is interested in the project and results?

## Our relevant stakeholders....

- Project Partners and Collaborateurs
- National Authorities (decision makers)
- Metrology Institutes
- Standard bodies and committees
- International bodies and organisations
- Industry
- Research Institutes, Universities, Researchers
- Related projects
- Interested Individuals



# How can we reach our stakeholders?

## Stakeholder involvement plan



1<sup>st</sup> June 2017 – 31<sup>st</sup> May 2020

JRP EMPIR 16ENV10: MetroRadon

Metrology for Radon monitoring

Stakeholder Involvement  
- Plan and Status

Version/date: September 2019

WP Number: 6

WP description: Creating Impact

Activity Numbers: A.6.1.6

Activity description: Stakeholder Involvement Plan

Lead Participant: AGES

Other Participants: all JRP-partners

### 3. RELEVANT STAKEHOLDERS.....

3.1.1. Project Partners and Collaborateurs.....

3.1.2. National Authorities (decision makers).....

3.1.3. Metrology Institutes.....

3.1.4. Standard bodies and committees.....

3.1.5. International and national bodies and organisations....

3.1.6. Industry .....

3.1.7. Research Institutes, Universities and Researchers .....

3.1.8. Related projects .....

3.1.9. Interested Individuals/Public .....

### 5. APPROPRIATE CHANNELS FOR EACH RELEVANT STAKEHOLDER GROUP...

|       | 3.1.1 | 3.1.2 | 3.1.3 | 3.1.4 | 3.1.5 | 3.1.6 | 3.1.7 | 3.1.8 | 3.1.9 |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 4.1.1 | X     | X     | X     | X     | X     | X     | X     | X     | X     |
| 4.1.2 | X     |       |       |       |       |       |       |       |       |
| 4.1.3 | X     | X     | X     | X     | X     | X     | X     | X     | X     |
| 4.1.4 | X     | (X)   | (X)   |       | (X)   | X     |       |       |       |
| 4.1.5 | X     |       | X     |       | X     |       | X     | X     | X     |
| 4.2.1 | X     | X     | (X)   |       | X     | X     |       |       |       |
| 4.2.2 | X     | X     | X     | X     | X     | X     | X     | X     |       |
| 4.3.1 | X     |       |       | X     |       |       | X     |       |       |
| 4.3.2 | X     |       |       |       |       | X     | X     |       |       |
| 4.3.3 | X     | X     | X     |       | X     | X     | X     | X     |       |
| 4.3.4 | X     |       |       |       |       |       |       |       |       |
| 4.3.5 | X     |       |       |       |       |       |       |       |       |
| 4.4.1 | X     | X     | X     | X     | X     | X     | X     | X     | X     |
| 4.4.2 | X     | X     | X     |       | X     | X     | X     |       |       |
| 4.4.3 | X     | X     | X     |       | X     | X     | X     | X     | X     |
| 4.5.1 | X     |       |       |       |       |       |       |       | X     |

### 4. INFORMATION CHANNELS.....

4.1 INFORMATION VIA WEB .....

4.1.1. Webpage with open access .....

4.1.2. Webpage with restricted access .....

4.1.3. Newsletter .....

4.1.4. Discussion Board .....

4.1.5. Research Gate .....

4.2 CO-OPERATIONS AND GROUPS.....

4.2.1. Industry Interest Group .....

4.2.2. Other Stakeholder Groups .....

4.2.3. Co-operation with relevant organisations, working groups and projects .....

4.3 CONFERENCES, WORKSHOPS AND TRAINING.....

4.3.1. Participation in scientific workshops and conferences .....

4.3.2. Comparison exercises .....

4.3.3. Project workshop and training .....

4.3.4. Technical visits .....

4.4 PUBLICATIONS.....

4.4.1. Scientific publications .....

4.4.2. Best practice guidelines.....

4.4.3. Other publications .....

4.5 OTHER EVENTS.....

4.5.1. Public events.....



# Knowledge transfer

Webpage – [www.metroradon.eu](http://www.metroradon.eu)



## MetroRADON

*Metrology for radon monitoring*



Overview of project, objectives

Partners

Workpackages WP

Upcoming activities

Documents

- Newsletter, Reports, Presentations, Papers,...

### Documents

This is the document section of the MetroRADON website where project outputs are shared.

### Newsletters & Status Reports

- [February 2020 newsletter](#)
- [Status Report February 2020](#)
- [July 2019 newsletter](#)
- [Status Report July 2019](#)
- [January 2019 newsletter](#)
- [Status Report January 2019](#)
- [July 2018 newsletter](#)
- [Status Report July 2018](#)
- [December 2017 newsletter](#)

### MetroRADON Workshops & Activities

- [Industry Interest Group \(IIG\) Meeting, 18 June 2019, Brunswick, Germany](#)
- [Transport of Radon and Thoron in Polymers, 21-22 March 2019, Sofia, Bulgaria:](#)
  - [Study of the partition coefficient and the diffusion length of radon in polymers at different temperatures: Experimental approach and results](#), S. Gregoriev (SUBG) et al.
  - [A better understanding of the morphology and the structure of the plastics versus the temperature conducive to correct radon measurements and to advanced Radon monitors](#), Luigi Tommasino and Dobromir Pressyanov (SUBG)
  - [Production of mixed radioactive gas atmosphere and proposition of setup to test <sup>222</sup>Rn and <sup>220</sup>Rn separation by polymer foils](#), Benoit Sabot (CEA)
  - [Remark on the potential influence of the way of polymer production on their radon absorption properties](#), Krasimir Mitev (SUBG)

### Reports & Journal Publications

- Maringer F.J., Wiedner H. and Cardellini F., 2020. An innovative quick method for traceable measurement of radon-222 in drinking water. Applied Radiation and Isotopes 155, 108907. <https://doi.org/10.5281/zenodo.3555047>



# Knowledge transfer

## Newsletter

- 2 newsletter/year
- Highlight newsletter (4-5 pages), Status report with detailed work report and results of all workpackages (10-15 pages)
- Status: 5 newsletters and status reports; last: November 2020
- Sent to stakeholders (national authorities, researchers, industry, registered interested individuals, international organisations): ~ 240 recipients
- & JRC-list, WHO-radon-list, ERA-list
- Available at MetroRADON webpage (Documents)
- Registration at website!



5<sup>th</sup> NEWSLETTER

### Executive Summary

The 3-year Research Project MetroRADON (Metrology for Radon Monitoring), funded within the European Metrology Programme for Innovation and Research (EMPIR) will come to its end in May 2020.

The purpose of the project is to develop reliable techniques and methodologies to enable SI traceable radon activity concentration measurements. More information can be found on the [MetroRADON website](#).

The results gained within the project need to be shared and discussed with the stakeholders. Results were already presented at several conferences all over Europe and published in reports and peer reviewed papers. More dissemination activities will follow in the next months. Two workshops and a training course will take place to inform the relevant stakeholders to present the MetroRADON results – we hope you will join us!

The final phase of the project has started and all results including the final report will be shared with you at the end of the project. We will inform you in the last Newsletter in May this year.

This newsletter highlights some recent actions from the project, lists some of the dissemination activities and announces the upcoming MetroRADON events. Details of the project tasks and results are discussed in the “[Status Report](#)” that can also be found on the [website](#). All the mentioned material is available on the [Document section](#) of the [MetroRADON website](#) and directly linked in this newsletter.

### MetroRADON collaborators

[DiMEILA Centro Ricerche INAIL](#), Italy

[EURADOS](#), international

[Istituto Superiore di Sanità](#), Italy

[LIFE-Respire-Consortium](#), international

[Radonova](#), Sweden

[University of Babes-Bolyai](#), Romania

[Universidade de Coimbra](#), Portugal

[University of Novi Sad](#), Serbia

### Partnership

**BEV-PTB:** Physikalisch-Technischer Prüfdienst des Bundesamts für Eich- und Vermessungswesen, Austria (coordinator)

**BEKH:** Budapest Főváros Kormányhivatala, Hungary

**CEA:** Commissariat à l'énergie atomique et aux énergies alternatives, France

**CMI:** Český Metrologický Institut, Czech Republic

**IFIN-HH:** Institutul National de Cercetare-Dezvoltare pentru Fizica si Inginerie Nucleara "Horia Hulubei", Romania

**PTB:** Physikalisch-Technische Bundesanstalt, Germany

**STUK:** Sateilyturvakeskus, Finland

**VINS:** Institut Za Nuklearne Nauke Vinca, Serbia

**AGES:** Österreichische Agentur für Gesundheit und Ernährungssicherheit, Austria

**BFS:** Bundesamt für Strahlenschutz, Germany

**CLOR:** Centrale Laboratorium Ochrony Radiologicznej, Poland

**IRSN:** Institut de Radioprotection et de Sureté Nucléaire, France

**JRC:** Joint Research Centre - European Commission, Europe

**SUJCHBO:** Státní ústav jaderné, chemické a biologické ochrany, v.v.i., Czech Republic

**SUBG:** Sofijski Universitet Sveti Kliment Ohridski, Bulgaria

**UC:** Universidad de Cantabria, Spain

**METAS:** Eidgenössisches Institut für Metrologie, Switzerland

### Contact

Franz Josef Maringer, Michael Stietka,  
JRP coordinator

Bundesamt für Eich- und Vermessungswesen  
Physikalisch-Technischer Prüfdienst

[contact@metroradon.eu](mailto:contact@metroradon.eu)

[www.metroradon.eu](http://www.metroradon.eu)



February, 2020

1

# Knowledge transfer

## Research Gate



### Project

## MetroRADON - Metrology for Radon Monitoring (EMPIR 16ENV10)

F. J. Maringer · Philippe Cassette · Nathalie Michielsens · [Show all 41 collaborators](#)

- Goal: 1. Development of novel procedures for the traceable calibration of radon ( $^{222}\text{Rn}$ ) measurement instruments at low activity concentrations (100 Bq/m<sup>3</sup> to 300 Bq/m<sup>3</sup>) with relative uncertainties  $\leq 5\%$  ( $k=1$ )
2. Influence of thoron ( $^{220}\text{Rn}$ ) and its progeny on radon end-user measurements and radon calibrations
3. Comparison and harmonization of radon measurement procedures in Europe
4. Study methodologies for the identification of radon priority areas and relationship between soil Rn exhalation and indoor Rn concentrations
5. Validation of traceability of European radon calibration facilities

Methods: Geostatistical Analysis, Alpha-particle Spectrometry, radionuclide metrology, Radon & Thoron measurement

Date: 1 June 2017 - 31 May 2020

Lab: [Mihail-Razvan Ioan's Lab](#)

Updates 16

Recommendations 10

Followers 90

Reads 1274

### Methods for the experimental study of $^{220}\text{Rn}$ homogeneity in calibration chambers

Article Jul 2020

Krasimir K. Mitev · Philippe Cassette · Dobromir Pressyanov · [...] · B. Sabot

This work presents two experimental methods for the evaluation of  $^{220}\text{Rn}$  homogeneity in calibration chambers. The first method is based on LSC of the  $^{220}\text{Rn}$  decay products captured in silica aerogel. The second method is based on...

### Qualitative overview of indoor radon surveys in Europe

Article Aug 2019

Gordana Pantelic · Igor Ćeliković · Milos Zivanovic · [...] · Valeria Gruber

[View](#)

### An innovative quick method for traceable measurement of radon $^{222}$ in drinking water

Article Sep 2019

F. J. Maringer · Hannah Wiedner · Francesco Cardellini

[View](#)

# Knowledge transfer

## Presentation at conferences & workshops & meetings

- At least 10 conference presentations
- Status: > 40 presentations/posters at European and international conferences in different fields (metrology, environment, radiation protection, radiation applications, geostatistics, geoscience, etc. – AARST, IRPA, ICRM,...)
- Most of the presentations available at the MetroRADON webpage (Documents)!

[www.metroradon.eu](http://www.metroradon.eu)



# Knowledge transfer

## Publications

- ☞ At least 10 peer reviewed papers
- ☞ Status: 10 published, several submitted/in preparation
- ☞ MetroRADON reviewed papers – open access!!!
- ☞ Several activity reports
- ☞ 8 Deliverables reports
- ☞ All publications available at the MetroRADON webpage (Documents)!

[www.metroradon.eu](http://www.metroradon.eu)

<https://www.euramet.org/repository/research-publications-repository-link/>

## Reports & Journal Publications

- Pressyanov, D., Dimitar D. 2020. The Problem with Temperature Dependence of Radon Diffusion Chambers with Anti-Thoron Barrier. Rom. J. Phys. 65, 801 (2020)  
[http://www.nipne.ro/rjp/2020\\_65\\_1-2/RomJPhys.65.801.pdf](http://www.nipne.ro/rjp/2020_65_1-2/RomJPhys.65.801.pdf)
- Fialova, E., Otahal, P., Vosahlik, J., Mazanova, M. 2020. Equipment for Testing Measuring Devices at a Low-Level Radon Activity Concentration. Int. J. Environ. Res. Public Health (17), 1904.  
<https://www.mdpi.com/1660-4601/17/6/1904>
- Rabago, D., Fuente, I., Celaya, S., Fernandez, A., Fernandez, E., Quindos, J., Pol, R., Cinelli, G., Quindos, L., Sainz, C. 2020. Intercomparison of Indoor Radon Measurements Under Field Conditions In the Framework of MetroRADON European Project. Int. J. Environ. Res. Public Health 17(5), 1780.  
<https://doi.org/10.3390/ijerph17051780>
- Otahal, P., Burian, I., 2020. Remarks to history of radon activity concentration metrology. Nukleonika 65(1), p. 45-49. [http://www.nukleonika.pl/www/back/full/vol65\\_2020/v65n1p045f.pdf](http://www.nukleonika.pl/www/back/full/vol65_2020/v65n1p045f.pdf)
- Maringer FJ., Wiedner H. and Cardellini F., 2020. An innovative quick method for traceable measurement of radon-222 in drinking water. Applied Radiation and Isotopes 155, 108907.  
<https://doi.org/10.5281/zenodo.3555047>
- Sabot, B., Rodrigues, M. and Pierre, S., 2020. Experimental facility for the production of reference atmosphere of radioactive gases (Rn, Xe, Kr, and H isotopes). Applied Radiation and Isotopes 155, 108934. <https://doi.org/10.1016/j.apradiso.2019.108934>
- Bossew, P., 2019. Radon priority areas and radon extremes – Initial statistical considerations. Radiation Environment and Medicine 8(2), 94-104.  
[http://crss.hirosaki-u.ac.jp/wp-content/files\\_mf/1568795052Web\\_REMVol828\\_PeterBossew.pdf](http://crss.hirosaki-u.ac.jp/wp-content/files_mf/1568795052Web_REMVol828_PeterBossew.pdf)
- Georgiev, S., Mitev, K., Dutsov, C., Boshkova, T., Dimitrova, I., 2019. Partition Coefficients and Diffusion Lengths of <sup>222</sup>Rn in Some Polymers at Different Temperatures. International Journal of Environmental Research and Public Health 16(22), 4523. <https://doi.org/10.3390/ijerph16224523>
- Pressyanov, D., Santiago Quindos Poncela, L., Georgiev, S., Dimitrova, I., Mitev, K., Sainz, C., Fuente, I., Rabago, D., 2019. Testing and calibration of CDs as radon detectors at highly variable radon concentrations and
- Pantelić, G., Čeliković, I., Živanović, M., Vukanac, I., Nikolić, JK., Cinelli, G., Gruber, V., 2019. Qualitative overview of indoor radon surveys in Europe. Journal of Environmental Radioactivity 204, p. 163-174. <https://doi.org/10.1016/j.jenvrad.2019.04.010>





# Knowledge transfer

## Industry Interest Group



- ☞ ~ 60 companies invited -> **27 members**
- ☞ Keep industry informed on developments in the project and obtain feedback
- ☞ Networking possibility among industry
  - Discussion board IIG
  - Industry Interest Group meeting – Braunschweig, June, 2019



**IIG Meeting, 18 June 2019**  
PTB, Brunswick, Bothe-Bau, Room 311

### AGENDA

| WHEN          | WHAT                                   | WHO                                     |
|---------------|--|---|
| 9:30 – 10:00  | Welcome + Introduction of participants | Dr. Stefan Neumaier                     |
| 10:00 – 10:30 | Presentation of MetroRadon             | Dr. Michael Stietka, Dr. Valeria Gruber |
| 10:30 – 11:00 | Radon: Quantities and Units            | Dr. Annette Röttger                     |
| 11:00 – 11:30 | Coffee break                           |   |

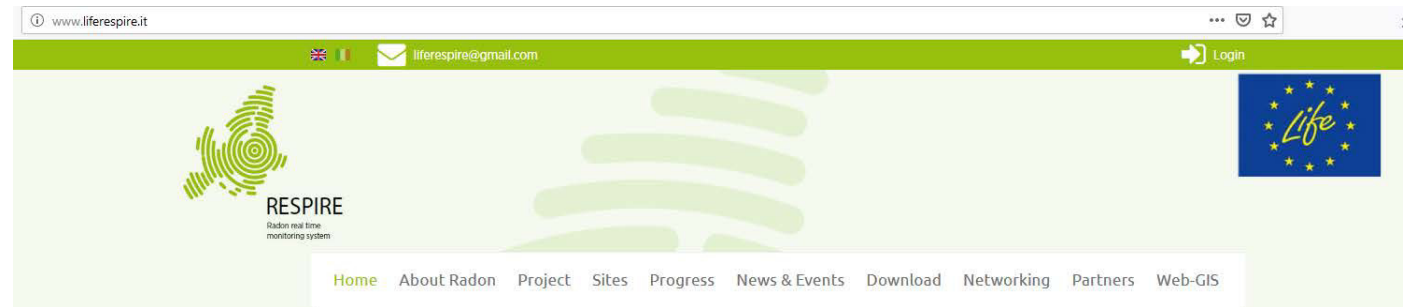
A screenshot of the MetroRADON website. The top navigation bar includes links for Home, News, Upcoming activities, Overview-objectives, Partners, Work packages, Documents, and Contact us. Below this is a secondary bar with Privacy policy / data protection declaration and Forum IIG (highlighted with a yellow circle). The main content area is titled "IIG" and shows a forum overview. It states "This forum contains 2 topics, and was last updated by Jose Luis Gutierrez Villanueva 3 weeks, 2 days ago." Below this, it says "Viewing 2 topics - 1 through 2 (of 2 total)". A table lists the topics: "What to do if the EURATOM BSS has not been implemented?" and "Welcome to the metroRADON forum of the IIG". To the right of the forum list, there is a sidebar with the MetroRADON logo and "MetroRADON Upcoming Events" including a workshop on harmonisation of radon measurement methodologies and another on new procedures for radon monitoring.

# Knowledge transfer

## Other activities



- Presentations at **national meetings** with authorities, research institutes, national radiation protection associations, etc.
- Presentations at **standard bodies** meetings
- Contact with international bodies about project (ERA, WHO, IAEA, HERCA,...)
- Co-operation with **Life-Respire project** (Radon real time monitoring system and proactive indoor remediation)
- Co-operation with **EURADOS**
  - EURADOS-WG-3 - subgroup „Radon“



# Some Highlights...

## ...for MetroRADON impact



### ☞ Patent submitted!

- „Compensating Module For Sensors For Measuring Of Radioactive Noble Gases (Bulg. Pat. Appl. Reg. Nr. 12897, priority 19.03.2019, inventor: D. Pressyanov, assignee: SUBG).

### ☞ EC-JRC technical report

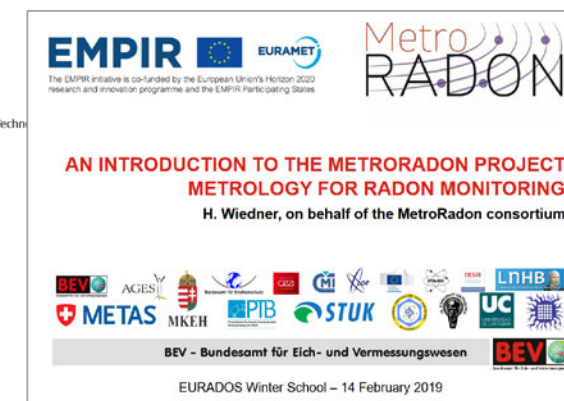
- Literature review of Indoor radon surveys in Europe, EUR 29613 EN



### ☞ Comparison exercises

- Comparison of existing radon gas primary standards according to CCRI(II) rules (registered at EURAMET under the number 1475 and at BIPM as EURAMET.RI(II)-S8Rn-222)

### ☞ Contribution to 12th EURADOS winter school



# Workshops and Training



## MetroRADON workshops and training for stakeholders

- ☞ Industry Interest Group meeting, Braunschweig, Germany, 18 June 2019 (PTB)
- ☞ Transport of Radon and Thoron in Polymers, Sofia, Bulgaria, 21-22 March 2019, (SUBG)
- ☞ Workshop „Harmonisation of radon measurement methodologies and radon priority areas” - results of WP2/WP3/WP4; part of **European Radon Week 2020**: Vienna, 25.-28. February 2020 (AGES, BEV) - in cooperation with ERA and EC JRC
- ☞ „Workshop on new procedures for radon monitoring” - results of WP1/WP2/WP5 (industry, authorities, scientific sector): 12.10.2020 (PTB)
- ☞ Training seminar „New procedures, guidelines and methodologies for radon instrument calibration and measurements”: 13. May 2020 (UC)



**European Radon Week 2020**

Vienna, 24-28 February 2020



# Uptake and Exploitation

## Activities and Uptake



- ☞ **Network** of European calibration laboratories for radon concentration in air measurements established
- ☞ Contact with international bodies (e.g. JRC, IAEA, WHO, ERA) to facilitate the creation of a **best practice guideline** for **radon mapping**
- ☞ **Guideline** which summarises the constituents of the chain „from primary standards to radon maps“ and the links between them - for a **sound metrology for radon calibrations at low levels** (target audience: radon calibration laboratories and end-users)
- ☞ **Open activities:**
  - Last newsletter with summary of results (November)
  - Publication of all Deliverables/Reports, Scientific papers and Guidelines

***Please use the MetroRADON results and material for sustainability of the project!***



Metro  
RADON

[www.metroradon.eu](http://www.metroradon.eu)

[contact@metroradon.eu](mailto:contact@metroradon.eu)

AGES

**Dr. Valeria Gruber**

Senior Expert

**AGES – Österreichische Agentur für Gesundheit  
und Ernährungssicherheit GmbH**

Wieningerstraße 8

A-4020 Linz

T +43 (0) 50 555-41906

[valeria.gruber@ages.at](mailto:valeria.gruber@ages.at)

[www.ages.at](http://www.ages.at)

