Comparison of Results of Radon Level Measurements Obtained with Charcoal Canisters and Airthings Detectors during Summer at TCAS

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RAD 2023, Herceg Novi

Summary

- Introduction to Radon
- Project
- Detectors (Charcoal canisters, Airthings detectors)
- Measurements
- Results
- Conclusion

Radon

- It is a colorless, odorless, inert noble gas.
- The most important radon isotopes 222Rn and 220Rn originate from uranium and thorium decay chains.
- Radon and radon's daughters are classified as carcinogens.
- It is released from the soil, water and construction materials into the atmosphere and the most significant part of radon dose is received by the inhalation of Rn and its progeny in closed spaces.

The project

- "*Radon Level Measurement*" was financed by the **Provincial Secretariat for Higher Education and Scientific Research.**

- Created and realised at Technical College of Applied Sciences in Zrenjanin (**TCAS**) in **2022**.

- The aim was to measure radon concentration level at TCAS.

Charcoal Canisters

- They consist of a closed cylindrical metal canister filled with activated charcoal.
- Radon and some of its decay products attach to the charcoal surface.
- The time of exposure is from 48 h up to 6 days.
- At the end of the measurement they are placed in sodium iodide gamma spectrometer for analysis and counting. Afterwards gamma counts are converted to radon concentration (EPA520 method).

Airthings radon detectors

- Airthings Correntium Home Radon Detector and View Plus Radon Detector used https://www.airthings.com/home .
- Active type detectors based **on alpha spectrometry.**
- Continuous monitoring.
- Capable of performing long-term measurements (up to 1 year) and also short-term measurements (1-7 days).
- Precision at 200 Bq/m3:
  - 10% for 7-day long measurements
  - 5% for two-month long measurements.

https://www.airthings.com/home

Measurements

- Two-day long radon concentration measurements were performed in eight rooms (at basement and ground floor level) during summer holidays.

- Open charcoal canisters and the Airthing detector were placed near to each other on a table of about 1 m height. Windows and doors in the rooms were kept closed and rooms were not ventilated for some time before the start of the measurements.

Results

Location	Airthings detectors	Charcoal canisters
Printing press office (basement)	28(8)	21(6)
Lab. for welding (basement)	27(8)	24(7)
Storage for technical equipment (basement)	24(7)	39(7)
Lab. for hybrid engines and vehicles (basement)	18(5)	20(6)
Library (ground floor)	63(19)	47(5)
Classroom 111 (ground floor)	21(6)	26(4)
Creativity studio (ground floor)	34(10)	62(5)
CIRT (ground floor)	31(9)	33(4)

- Results of parallel measurements show good level of agreement (within measurement uncertainties of the implemented methods).

- The largest contribution to measurement uncertainties comes from bad statistics due to low concentration levels.

Conclusion

- Even a small percentage of radon is harmful.
- WHO recommendation: <100 Bq m^{-3}.
- The levels of indoor radon concentrations measured with both charcoal canisters and Airthings detectors during summer 2022 at TCAS are within acceptable values, below our National Reference Limit (I.e 400 Bq $/m^{-3}$ for old buildings).
- There is also good agreement of results obtained with both type of detectors (Charcoal canisters and Airthings detectors).