



National Center of Radiobiology and radiation Protection  
Ministry of Health

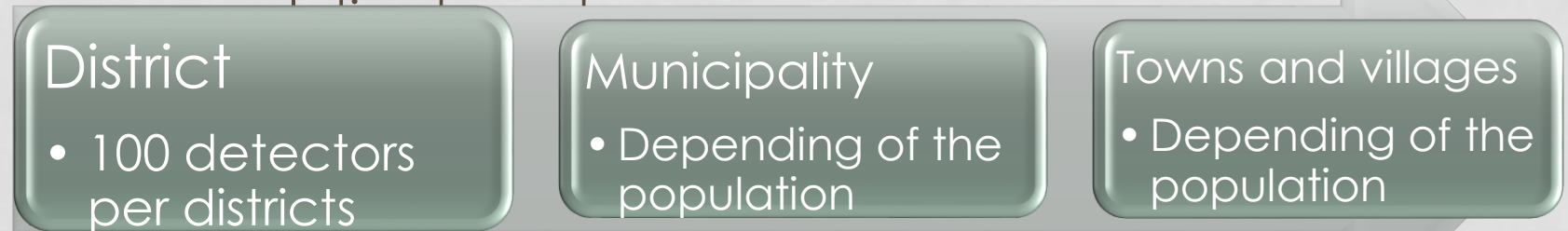


# RESULTS OF THE NATIONAL RADON INDOORS SURVEY IN BULGARIA

KREMENA IVANOVA

# NATIONAL SURVEY DESIGN

## ❖ Sampling scheme



Total number of planed investigated dwellings – **2800**

- ❖ Sampling point - randomly selected dwellings using a door-to-door approach by **Health Regional Inspectorates**
- ❖ Monitored floor – ground floor or floor which is inhabited and contact with ground
- ❖ Monitored room – living room, bedroom, nursery on a shelf or over a wardrobe or a bookcase

# NATIONAL SURVEY DESIGN

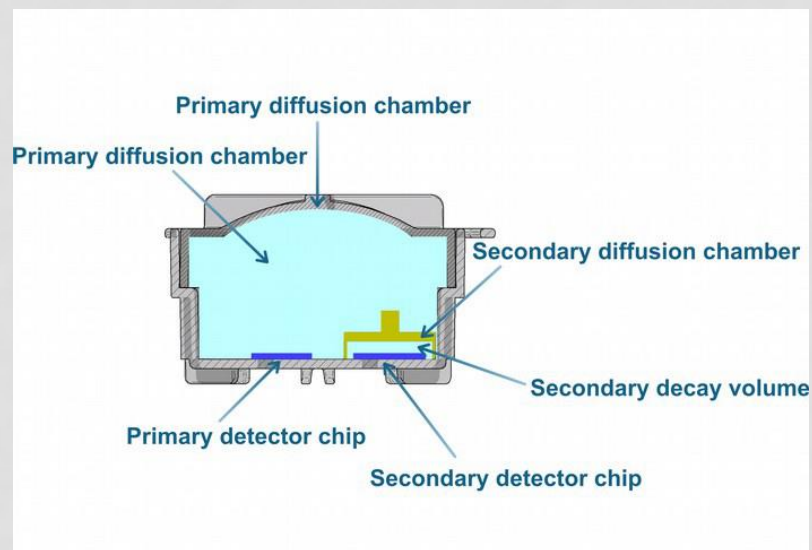
- ❖ Measurement period – one years into two phases
  - The first phase covered the summer-autumn session,
  - The second phase covered the winter-spring session.
  - The detectors were collected and replaced by the Regional Health Inspectorates.
- ❖ Approximately data – start: April 2015 and finish: May/June 2016
- ❖ Questionnaire – to identify dwelling characteristics and other parameters (such as living habits)
- ❖ Processing the detectors and analyzing the results - National Centre of Radiobiology and Radiation Protection.



# NATIONAL SURVEY DESIGN

- Measurement devices - RADOSYS nuclear track detectors (CR-39) – RSFV type.
- Two chips for providing the linearity of calibration.

- ❖ **Processing the detectors and evaluation the Rn concentration – implementation the ISO 11665-4:2012 „Measurement of radioactivity in the environment - Air: radon-222 - Part 4.**
- ❖ **The total numbers of processing detectors for first phase 5262 and for second - 5242**
- ❖ **The total number of processing chips – 10504**



# NATIONAL SURVEY DESIGN

- **Assessment of the annual radon concentration for each dwelling**
    - For two results per dwelling - as the weighted average (approximately for 2600 dwellings)
    - For one results per dwelling - applying the session correction from results of the regions
  - **QA/QC**
    - Calibration of each batch – exposure the detectors in reference accredited laboratory (BfS – Germany)
    - Duplicated measurement for each phase and transit detectors
      - First phase – 90.7 % acceptable and 9.3% not acceptable
      - Second phase - 91.3 % acceptable and 8.7% not acceptable
- 10% - warning level and 20% - critical level

# RESULTS AND DISCUSSION

- Descriptive statistics

Parameter	CRn (1)	CRn (2)	CRn
N	2613	2597	2778
Minimum	10	11	11
Maximum	995	1983	1314
Median	76	91	78
AM	100	142	111
SD	83	151	105
Variation coefficient (CV)	83%	106%	95%
GM	76	98	81
GSD	2.09	2.33	2.15

# CONCLUSION

- ❑ The National Survey allows presenting a systematized distribution of indoor radon concentrations on the territory of the country, which is representative for the exposure of the Bulgarian population to radon in homes.
- ❑ Differences in the set percentage for the different areas of the country or the average values can be used to apply the graded approach to address the long-term risk of radon exposure.
- ❑ Mean values are comparable with published values for European countries and can be the basis for drafting a national strategy to reduce exposure to radon in Bulgarian population.
- ❑ The results of the National Survey confirm the need to continue the joint efforts of national institutions to reduce the general risk to the population as well as the individual risk for each individual.

# Thank you for attention!

I sincerely thank all Regional Health Inspectorates for the tremendous work they have done, as well as everyone who participated in and supported the study and the preparation of the material.