



LSC BASED APPROACH FOR RADON IN SOIL GAS MEASUREMENTS

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Radon in soil gas measurement

Separate sampling and measurement approach

All in one measuring system,
in-situ measurement:
Markus 10 by Radon Analytics,
or RAD 7 by DurrIDGE,
...

- Air sampling (**RADON v.o.s.**);
 - Radon measurement in air probe:
 - by Ionization chamber,
 - by Lucas cell,
 - ...
 - by **LSC** based charcoal method on base scintillation vials coated by thermoplastic scintillator MeltilexTM (**sensitive enough**)
- or
- Radon sampling different approach (**LSC**)
 - Bubbler > LS vial (anytype: plastic)

Sampling



Radon probe at LS vial or
at bubbler



Measurement

Laboratory based LS spectrometer



Portable LS spectrometer



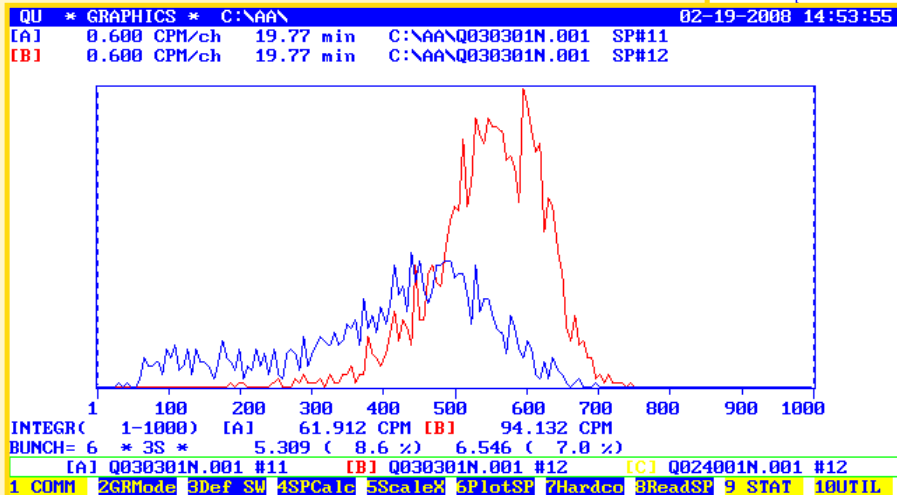
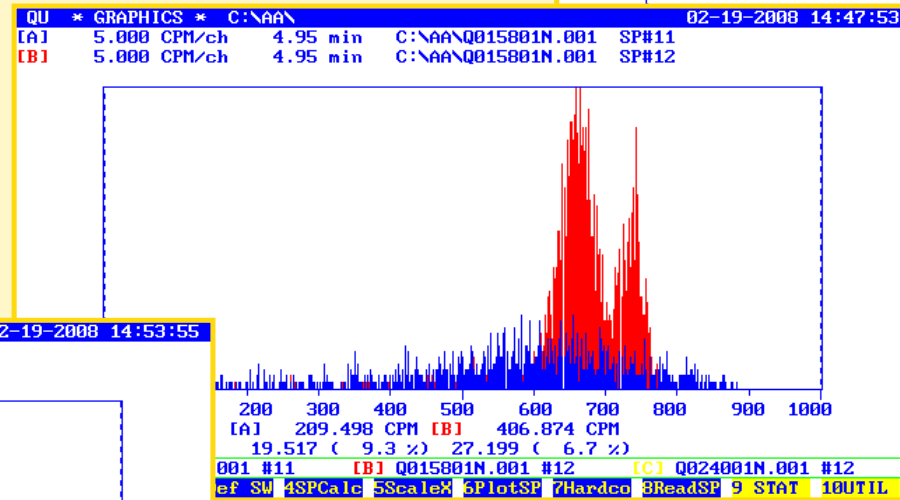
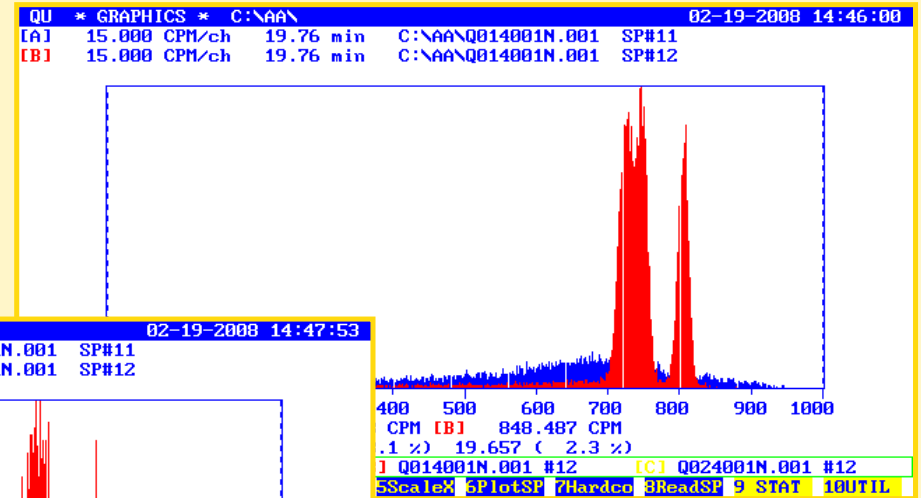


SPECTRA PERFORMANCES

Teflon™ vial, toluene

Plastic vial, toluene

Teflon™ vial, Meltilex™





Counting performances

Counting efficiency for ^{222}Rn measurement in MeltilexTM coated Teflon[®] vials is **178%** (Kaihola, 1992; Kaihola, 1996)

Vial volume is **22 ml**,

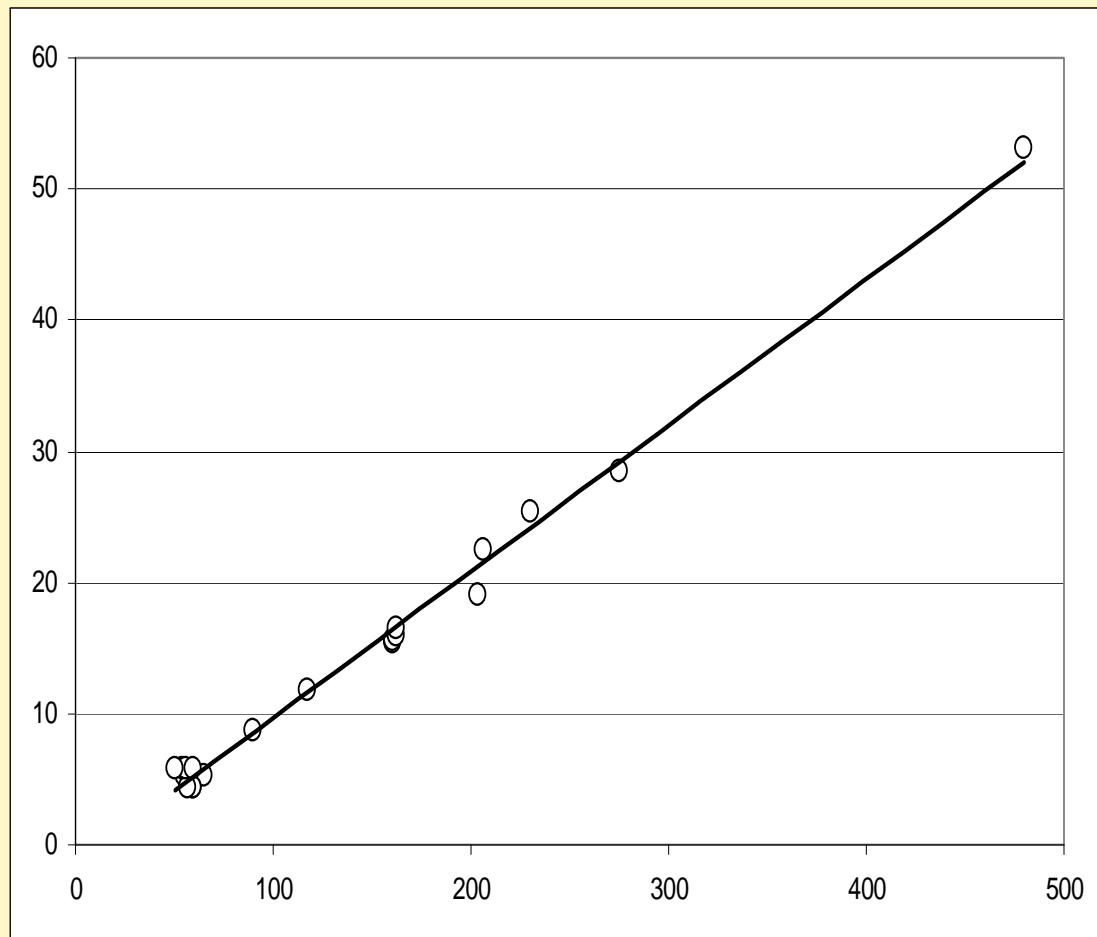
Radon in soil gas at the level of **1 kBq·m⁻³**,

Count rate is ca. **2.4 CPM** for direct counting in MeltilexTM coated vials,

and

up to **36-48 CPM** (depending on time and bubbler volume) for radon sample initially trapped in bubbler with toluene and then counted in plastic vial.

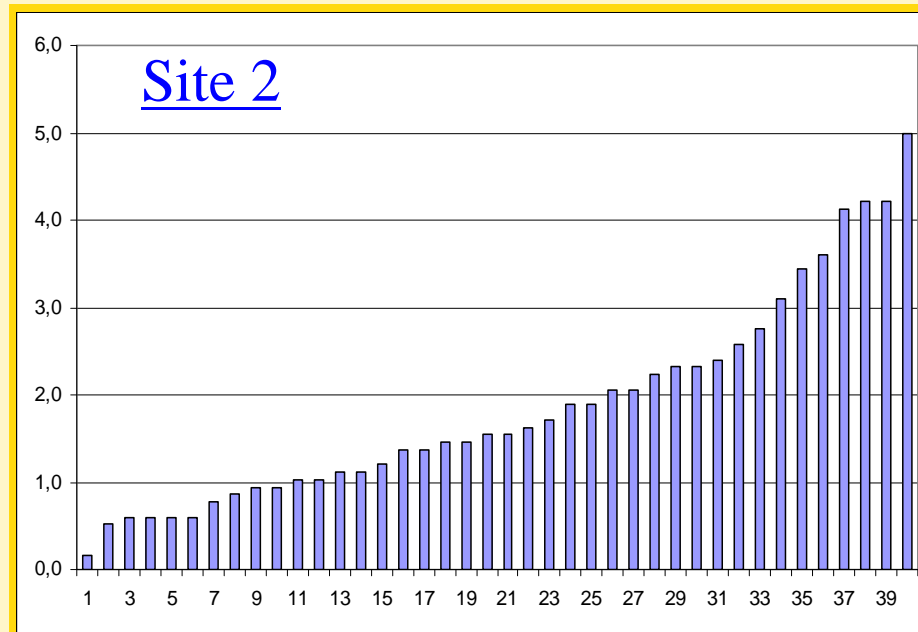
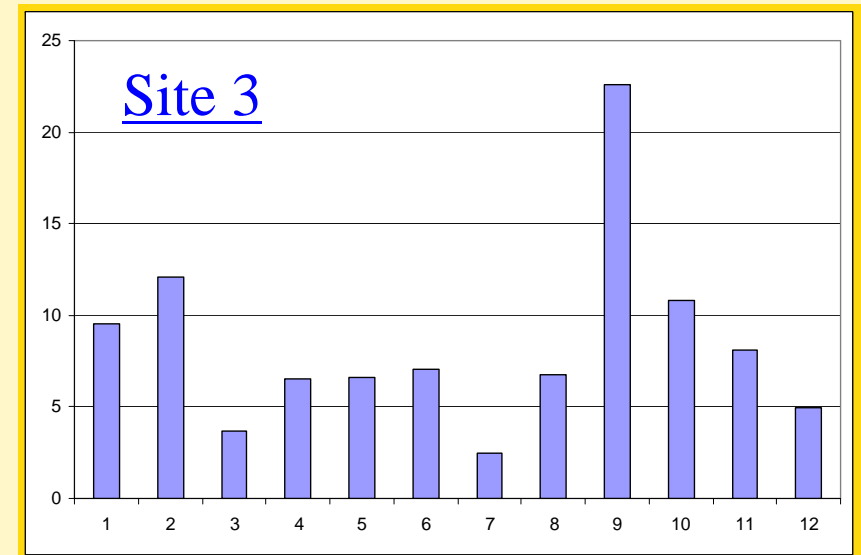
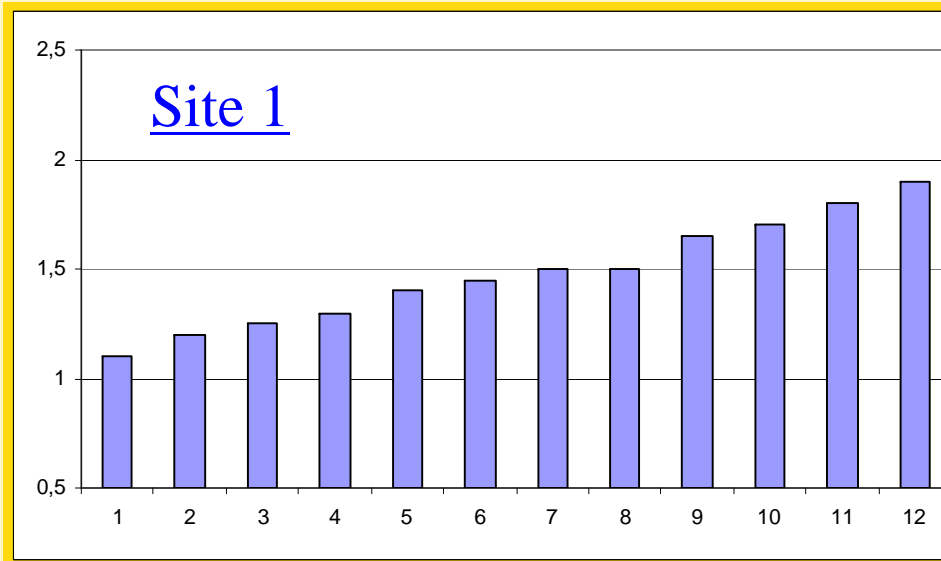
CPM,
,
direct



CPM, bubbler



Site examples



Radon in soil characteristics in some sites (kBq·m⁻³)

Characteristic	Site 1	Site 2	Site 3
Average	1,48	1,86	8,4
SD	0,25	1,18	5,2
Percentage	17%	63%	62%
N	12	40	12



CONCLUSION

- Approach where sampling and counting are performed separately is well applicable for radon in soil gas measurement especially when large number of measurements is required.
- As it is seeing scintillation vial measurement is appropriate tool used for direct radon in soil gas measurement.
- Radon bubbling approach allows increased sensitivity of radon in soil gas measurement up to 15-20 times comparing to direct measurement on base of LS vial. Standardized LS samples on base of organic cocktail minimize counting time required for one probe.
- Combined method including main part based on application of bubbler trap set for radon in soil gas sampling together with conventional counting for samples and addition LS vial used as direct method of radon in air measurement for calibration has good calibration and is ultra sensitive.
- When bubbling system used LS cocktail allows repeated use.



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THANK YOU