

THORON-SCOUT The first diffusion based Radon and Thoron active monitor for long term measurements in buildings

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Nis
27- 30 Mai 2014



SARAD - Introduction

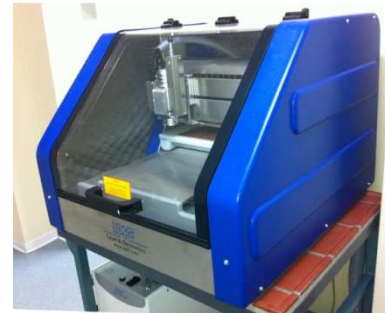
- **Company with established reputation and many years of experience, located in Dresden, Germany.**
- **The core competence of the company is the design and the production of devices and systems for environmental radioactivity measurements and radioactivity analysis.**
- **SARAD offers a unique spectrum of Radon, Radon progeny and aerosol monitors for nearly any application.**



Equipment for R&D and production



Assembly line



Rapid prototyping



Bonding



R&D debugging

Closer to your application!



Radon Scout Plus



RTM1688-2



RTM2200



EQF3220



DOSEman PRO



Spectra 5011/5031T

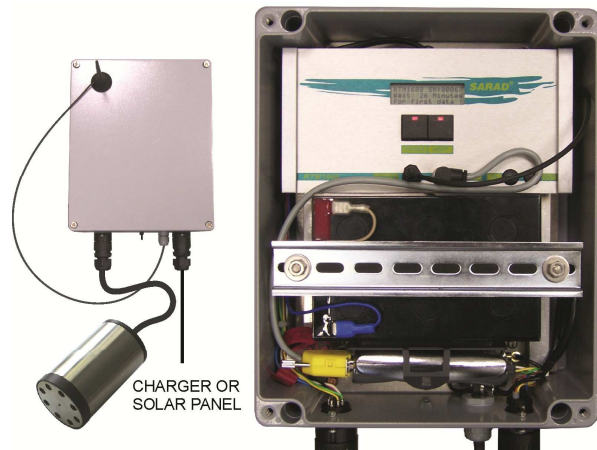


IndoorAir Sensor



MyRIAM

Further Products...



RTM-2100 GEO-Station



RTM-2100 GEO-Station



Detectors...

A2M 4000 - Areamonitor



Nuc Scout

with
wire less 2,4 GHz
ZigBee
Datatransfer



... and the new device:

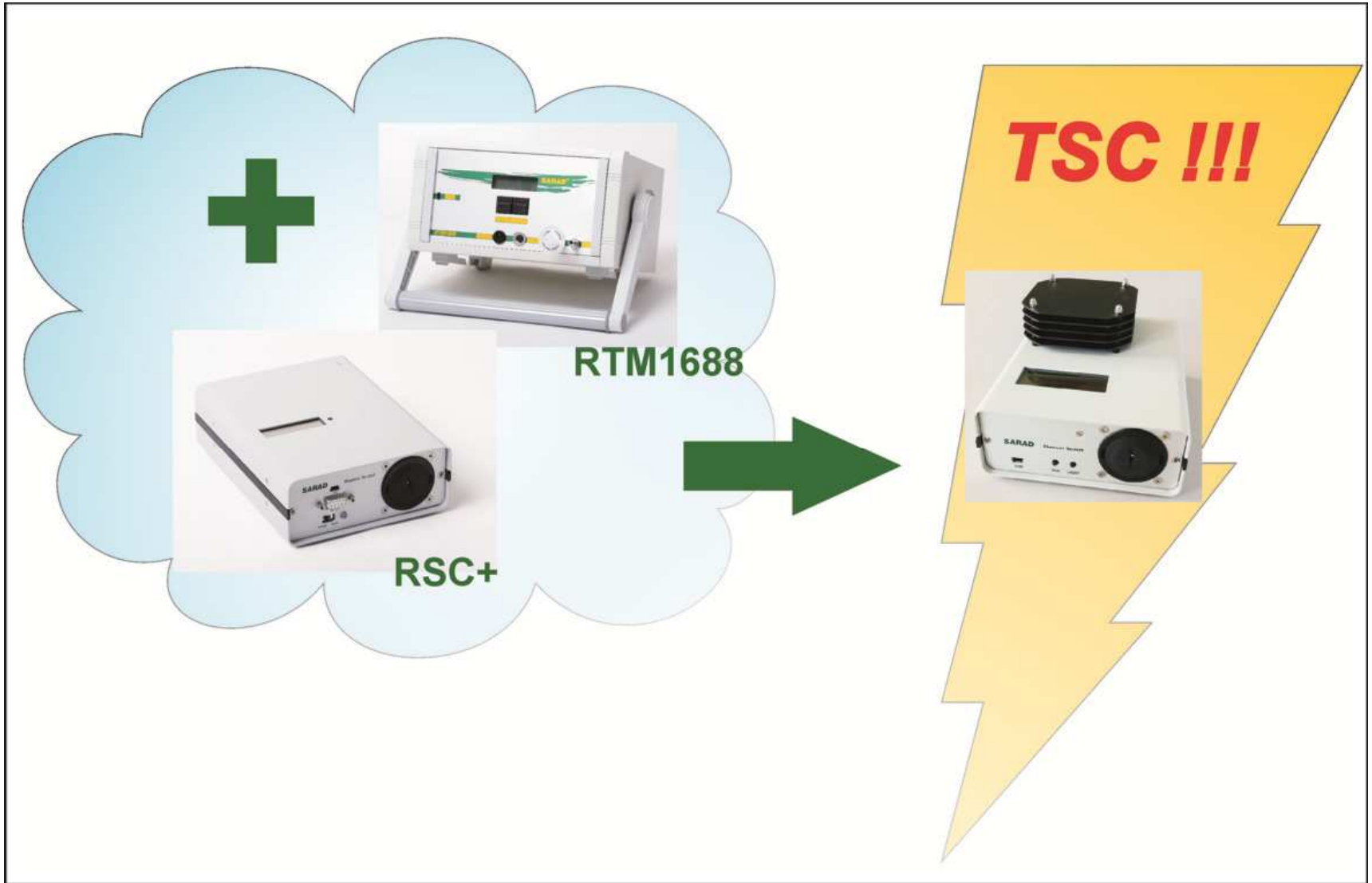


SIMPLE

FAST

SAFE

Bio-Scout





Fast diffusion of measurement gas in Thoron-Scout

the pros:

- No pump necessary!!
 - smaller power consumption
 - longer measurement time
 - no vibrations
 - no noise
 - longer device reliability (no movable mechanical parts)

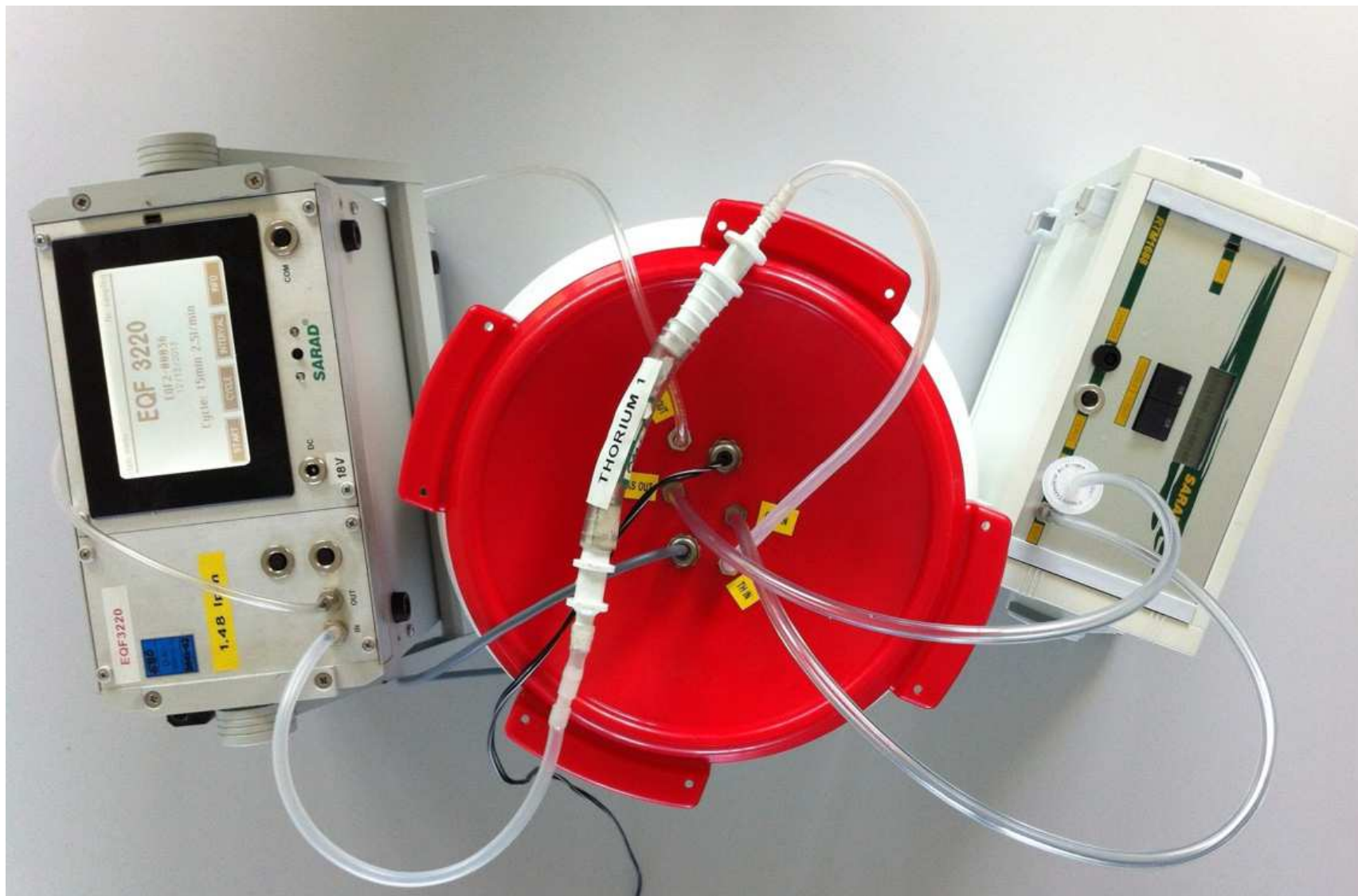
... and cons:

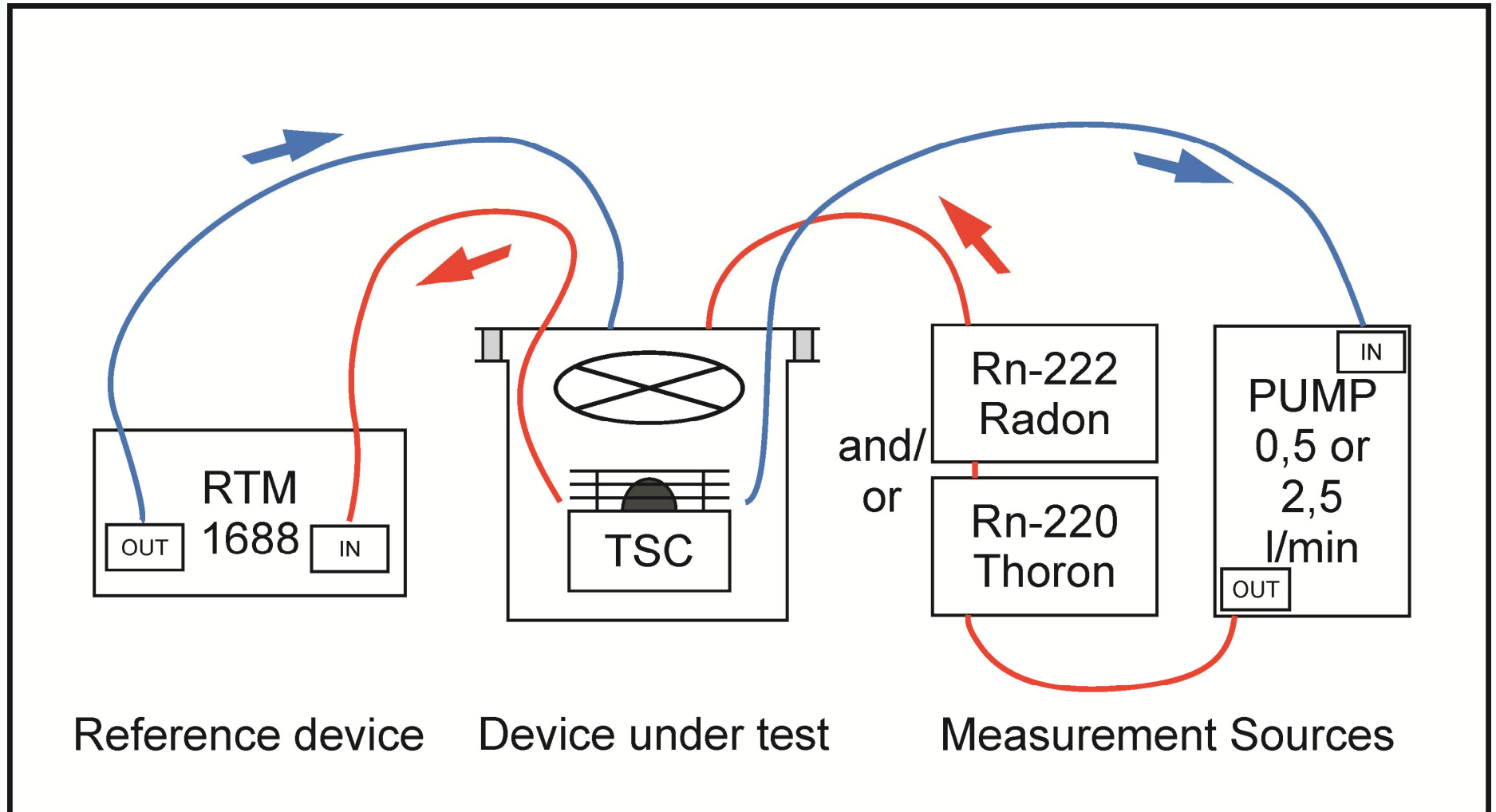
- Measurements only at the device exact localization
 - no water or soil analysis possible

Parameters/ Device	Thoron-Scout	RTM 1688
Detectors	1	4
Thoron sensitivity	0,670 cpm/(kBq/m ³)	2,120 cpm/(kBq/m ³)
Rn-222 Measurement	YES	YES
Spectral Analysis	YES	YES
Data records	2047	2047
Pump	NO	0,3 l/min
Operating Time	1 Month	5 Days
Display	4 line x 20 characters	3 line x 16 characters
Size	135 x175 x90	232 x182 x135
Weight	1,1 kg	3,5 kg

Other features of Thoron-Scout:

- Power supply by AC/DC wall adapter possible
- Measurement cycle time adjustable: from 1 minute up to 240 minutes
- One button control (lock-function)
- RS232 and USB interface for set-up and data transfer (also via modem or ZigBee)
- Additional sensors: temperature, relative humidity, barometric pressure, movement detector
- Fast/ slow mode for Radon Measurements
- Radon Vision Software for data measurements results presentation



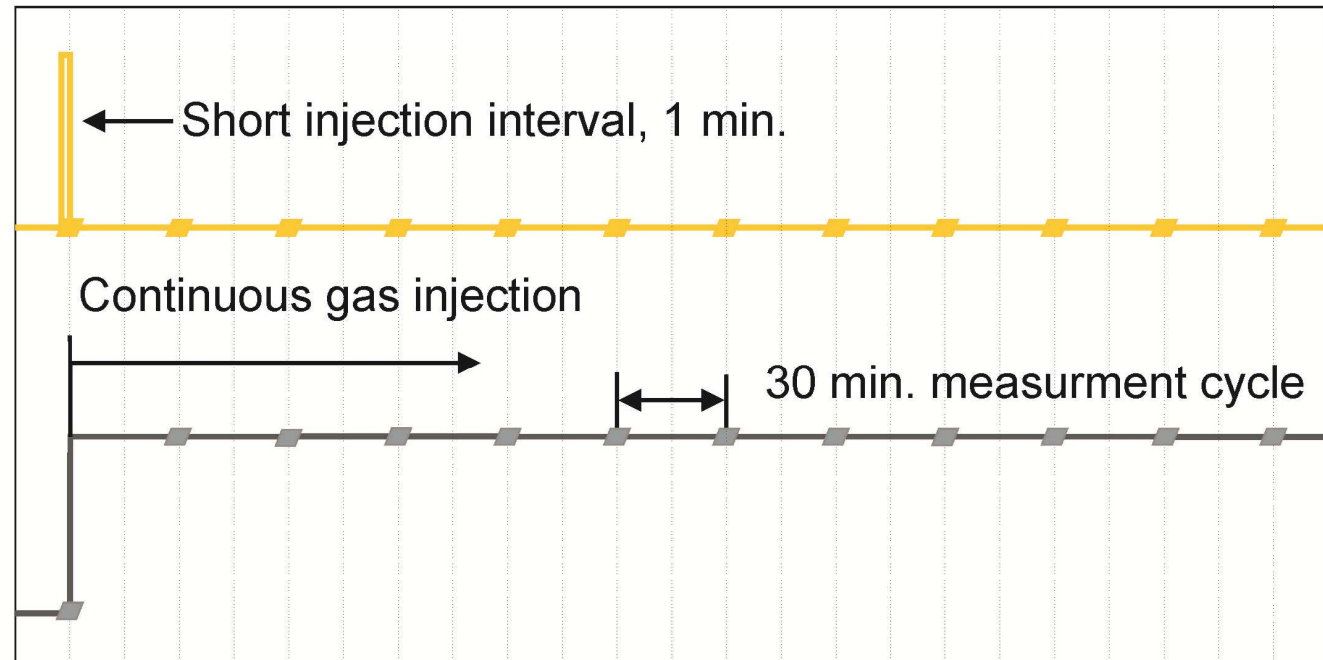


Scenario 1. Continuous Thoron Measurement

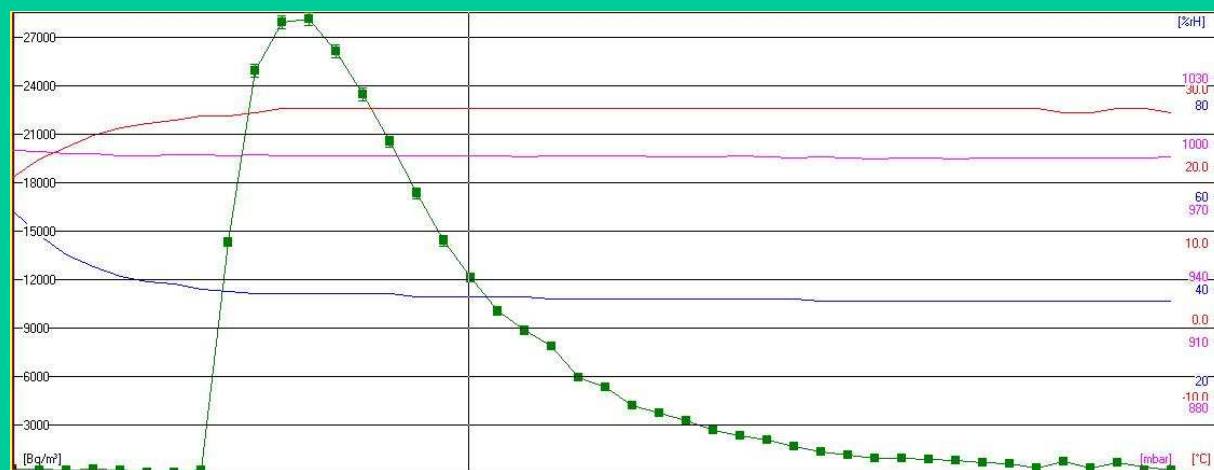
Rn-222
Radon

Source gas flow
in Test Chamber

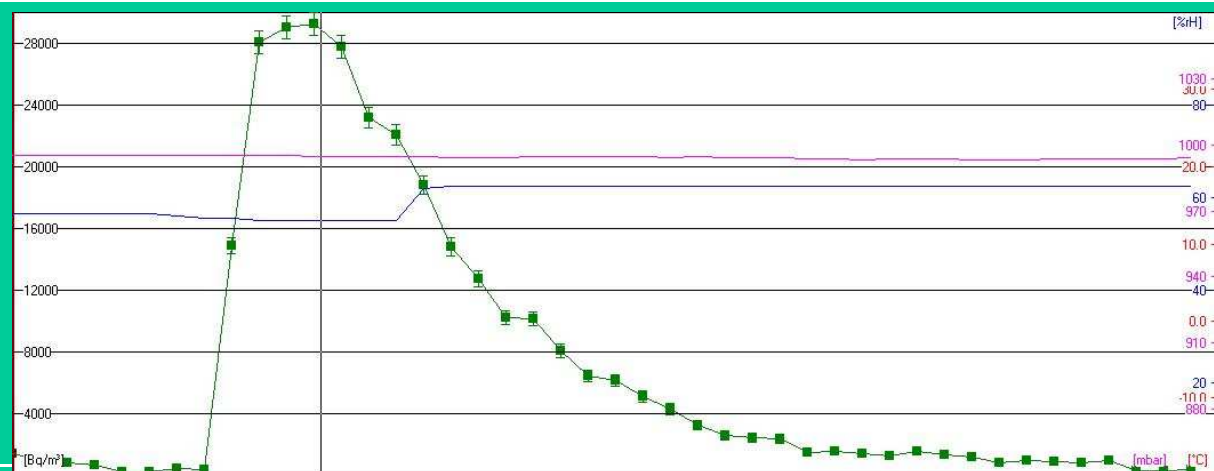
Rn-220
Thoron



Radon measurement, 21.5 hours exposure time, 30min measurement cycle

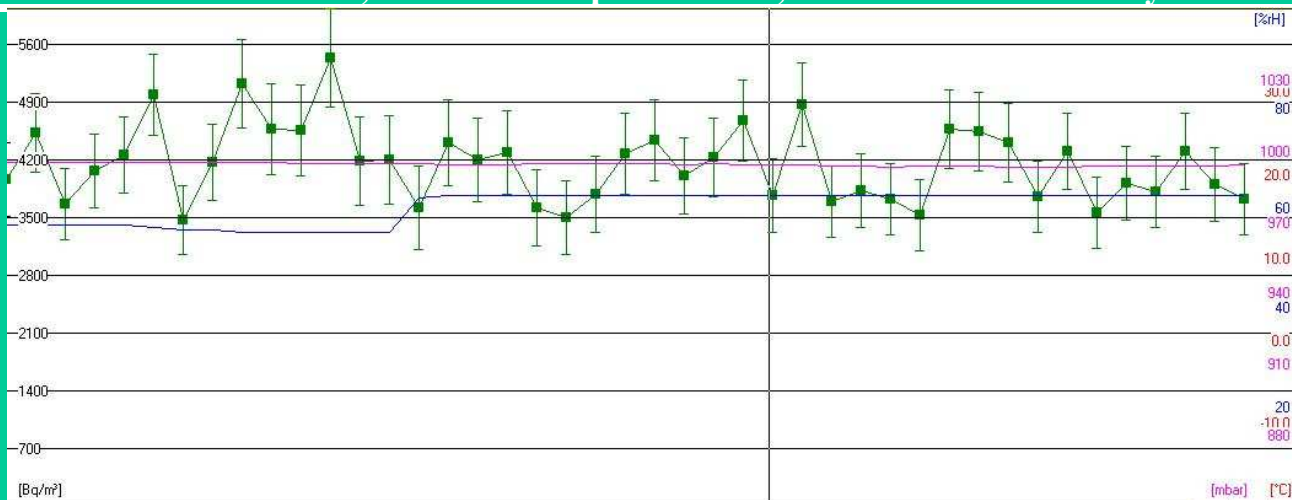


TSC

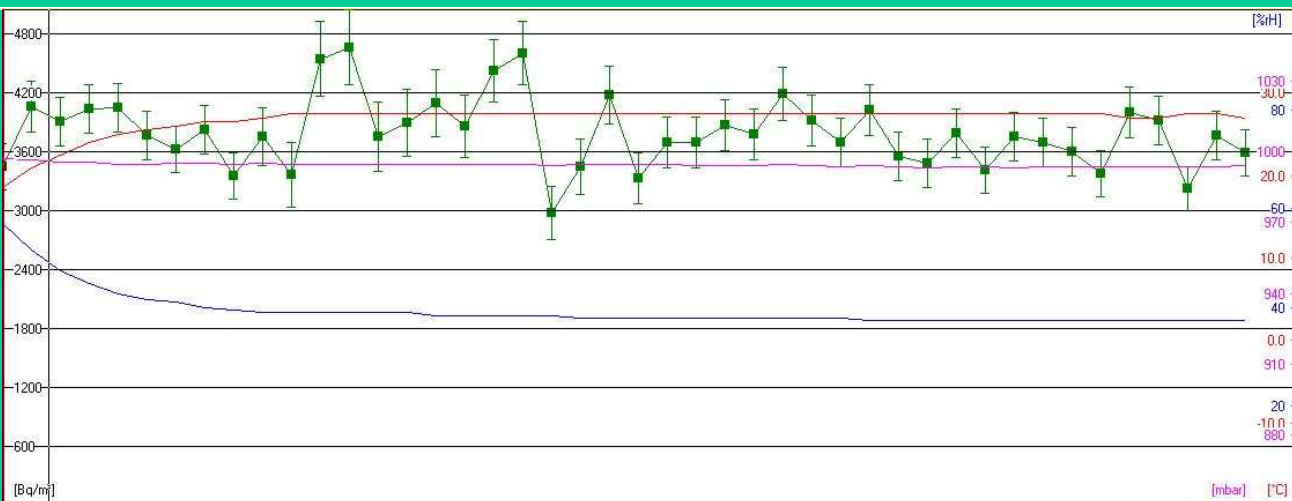


RTM1688

Thoron measurement, 21.5 hours exposure time, 30min measurement cycle



TSC

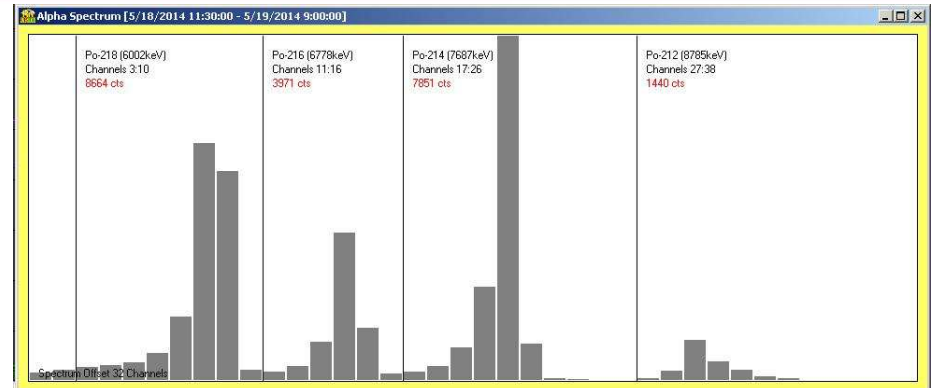


RTM1688



TSC

$$\begin{aligned} \text{Po218}_{\text{TSC}}(\text{cts}) / \text{Po218}_{\text{RTM1688}}(\text{cts}) &= 8664 / 26625 = 0,325 \\ \text{Po216}_{\text{TSC}}(\text{cts}) / \text{Po216}_{\text{RTM1688}}(\text{cts}) &= 3971 / 12784 = 0,311 \\ \text{Po214}_{\text{TSC}}(\text{cts}) / \text{Po214}_{\text{RTM1688}}(\text{cts}) &= 7851 / 25385 = 0,309 \end{aligned}$$



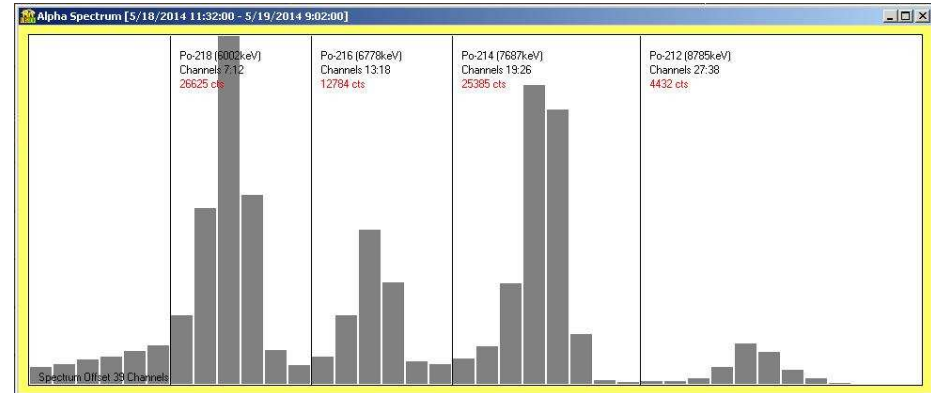
RTM1688

$$\text{Po212}_{\text{TSC}}(\text{cts}) / \text{Po212}_{\text{RTM1688}}(\text{cts}) = 1440 / 4432 = 0,325$$

$$\text{Po21X}_{\text{TSC}}(\text{cts}) / \text{Po21X}_{\text{RTM1688}}(\text{cts}) \approx \text{constant} !!$$

Conclusion:

The losses by diffusion process are negligible, otherwise the ratio of Po218 would be different from the Po-216 ratio.

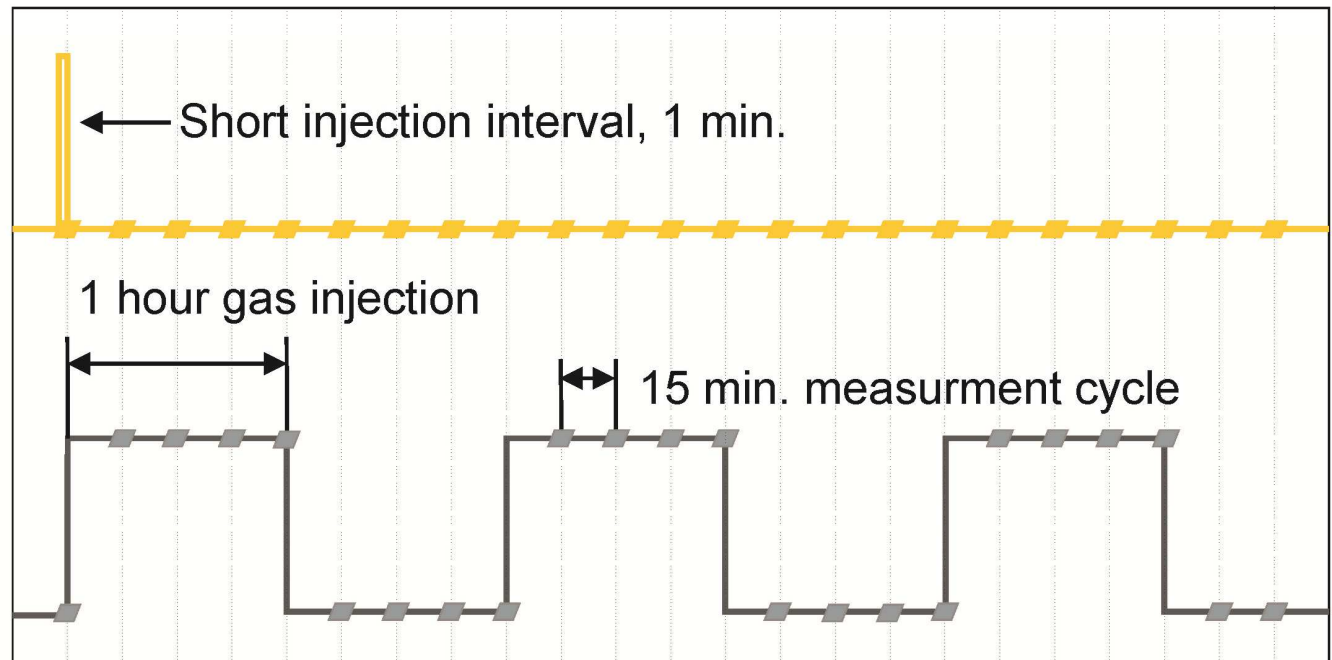


Scenario 2. Interval Thoron Measurement

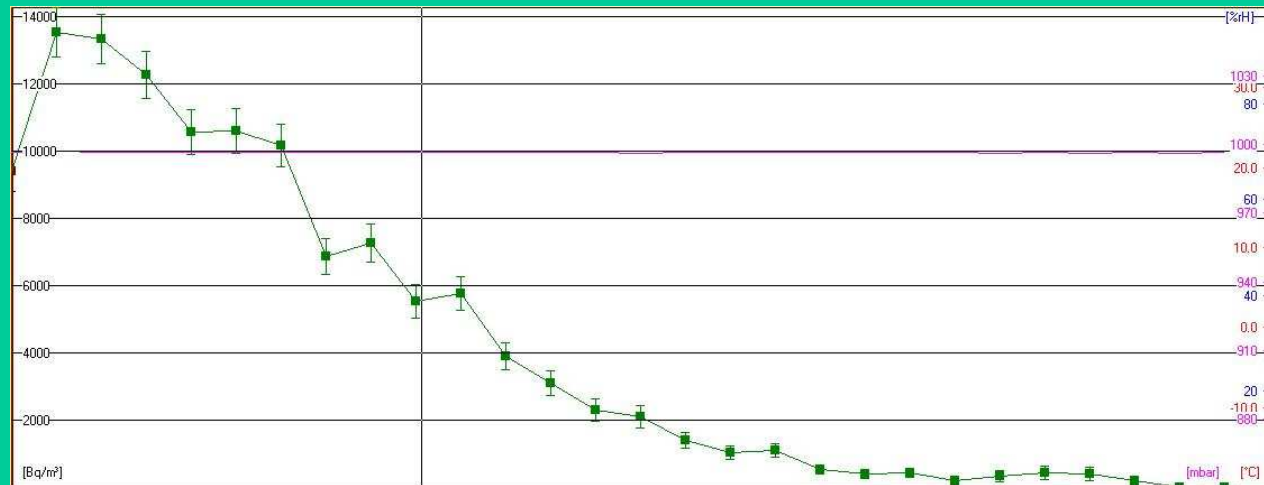
Rn-222
Radon

Source gas flow
in Test Chamber

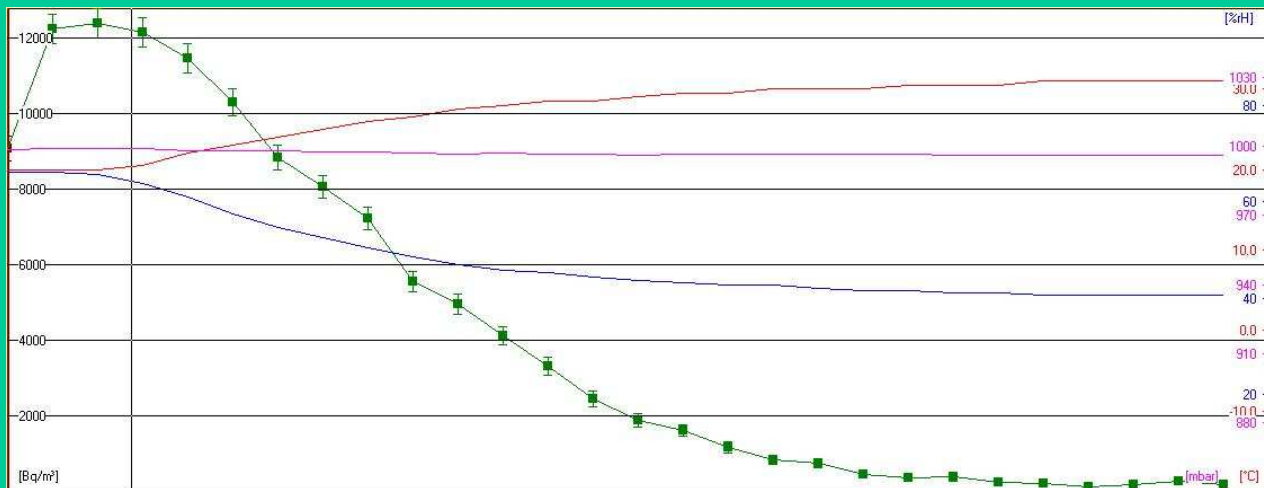
Rn-220
Thoron



Radon measurement, 7 hours exposure time, 15min measurement cycle

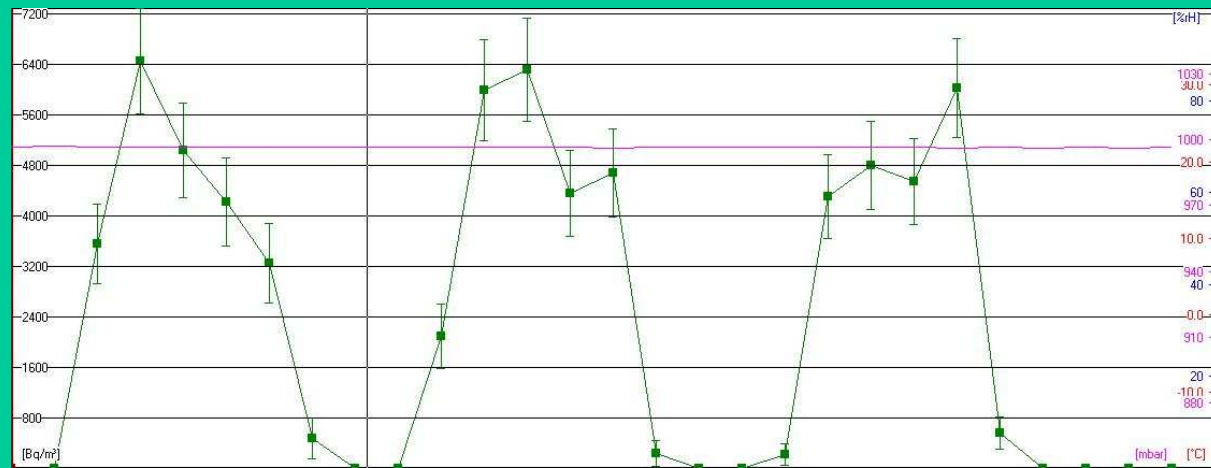


TSC

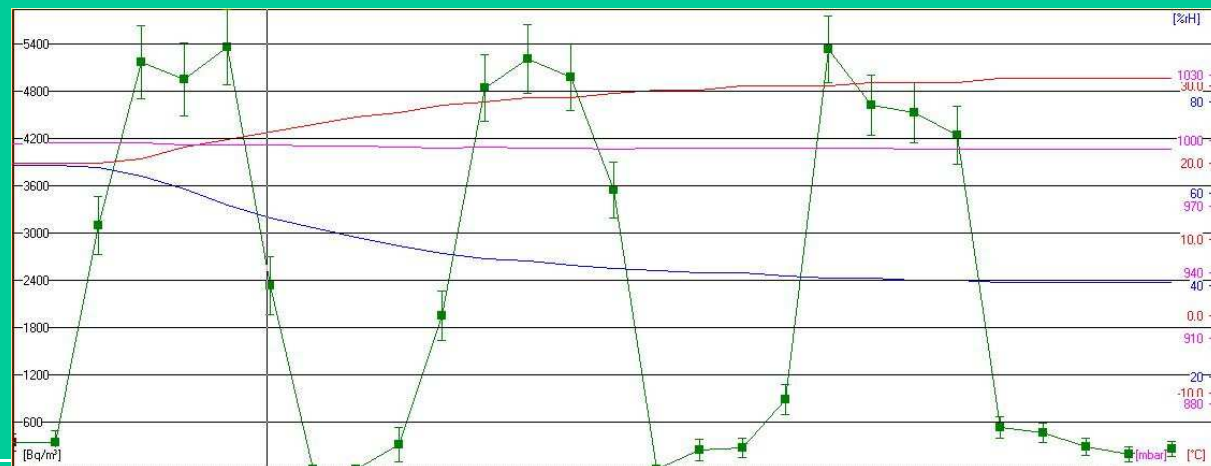


RTM1688

Thoron measurement, 1 hour exposure interval time, 15min measurement cycle



TSC



RTM1688

TSC

$$\text{Po218}_{\text{TSC}}(\text{cts}) / \text{Po218}_{\text{RTM1688}}(\text{cts}) = 1742 / 5534 = 0,315$$

$$\text{Po216}_{\text{TSC}}(\text{cts}) / \text{Po216}_{\text{RTM1688}}(\text{cts}) = 748 / 2549 = 0,293$$

$$\text{Po214}_{\text{TSC}}(\text{cts}) / \text{Po214}_{\text{RTM1688}}(\text{cts}) = 1602 / 5555 = 0,288$$

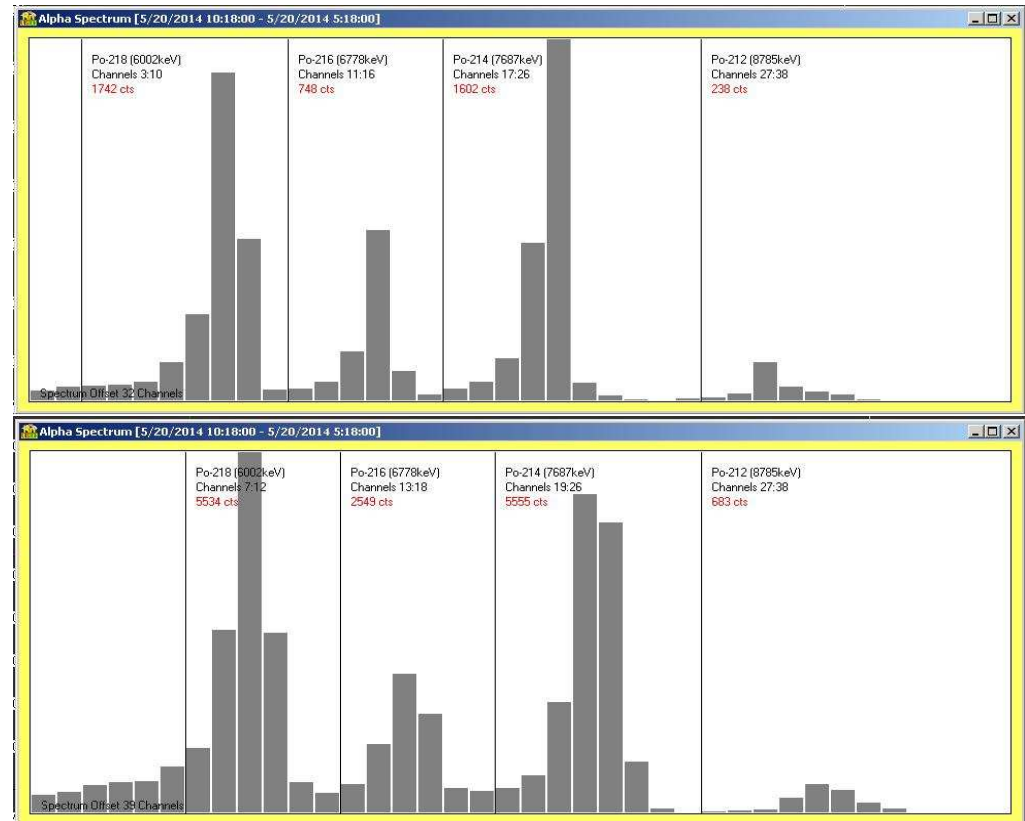
RTM1688

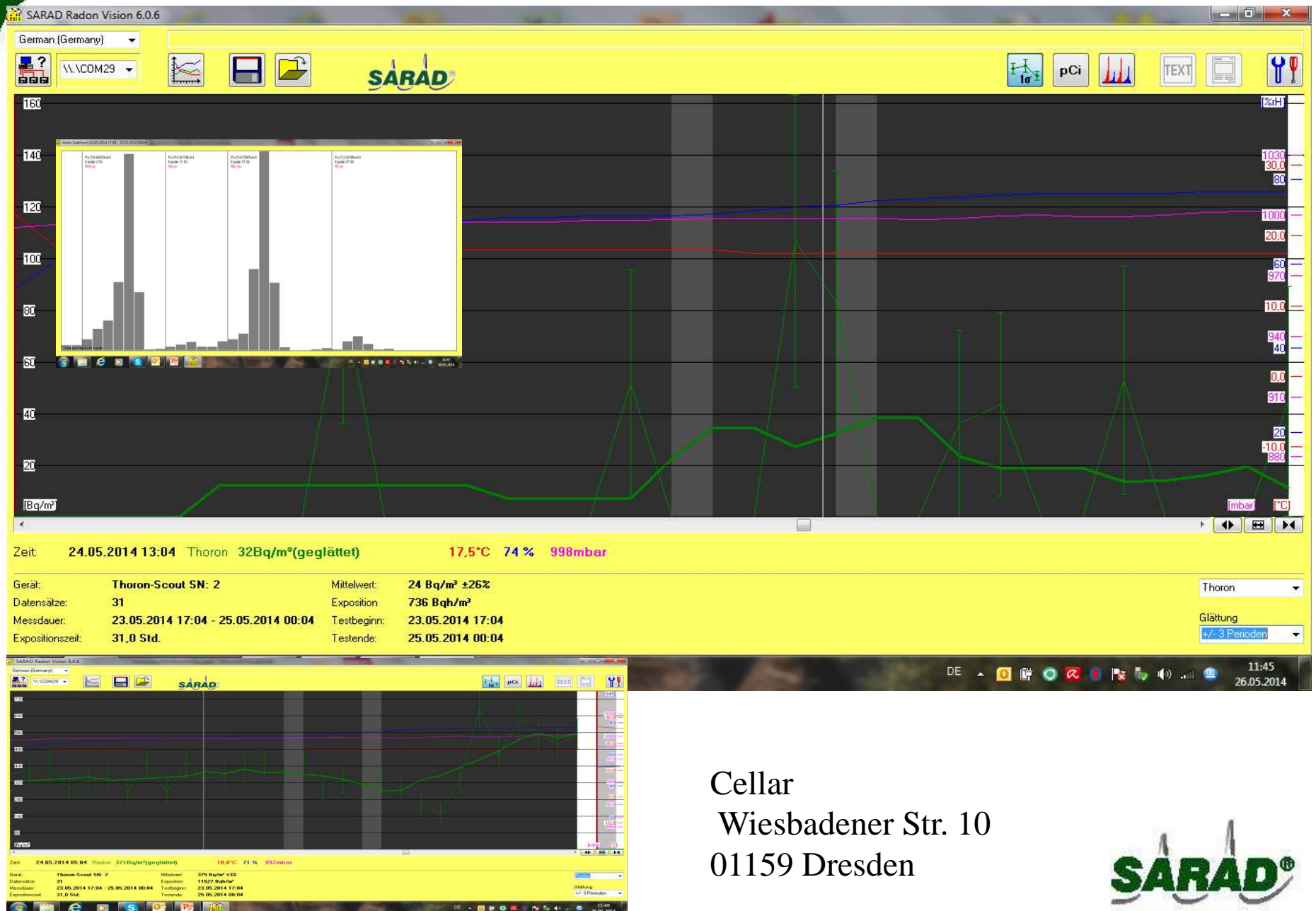
$$\text{Po212}_{\text{TSC}}(\text{cts}) / \text{Po212}_{\text{RTM1688}}(\text{cts}) = 238 / 683 = 0,348$$

$$\text{Po21X}_{\text{TSC}}(\text{cts}) / \text{Po21X}_{\text{RTM1688}}(\text{cts}) \approx \text{constant !!}$$

Conclusion:

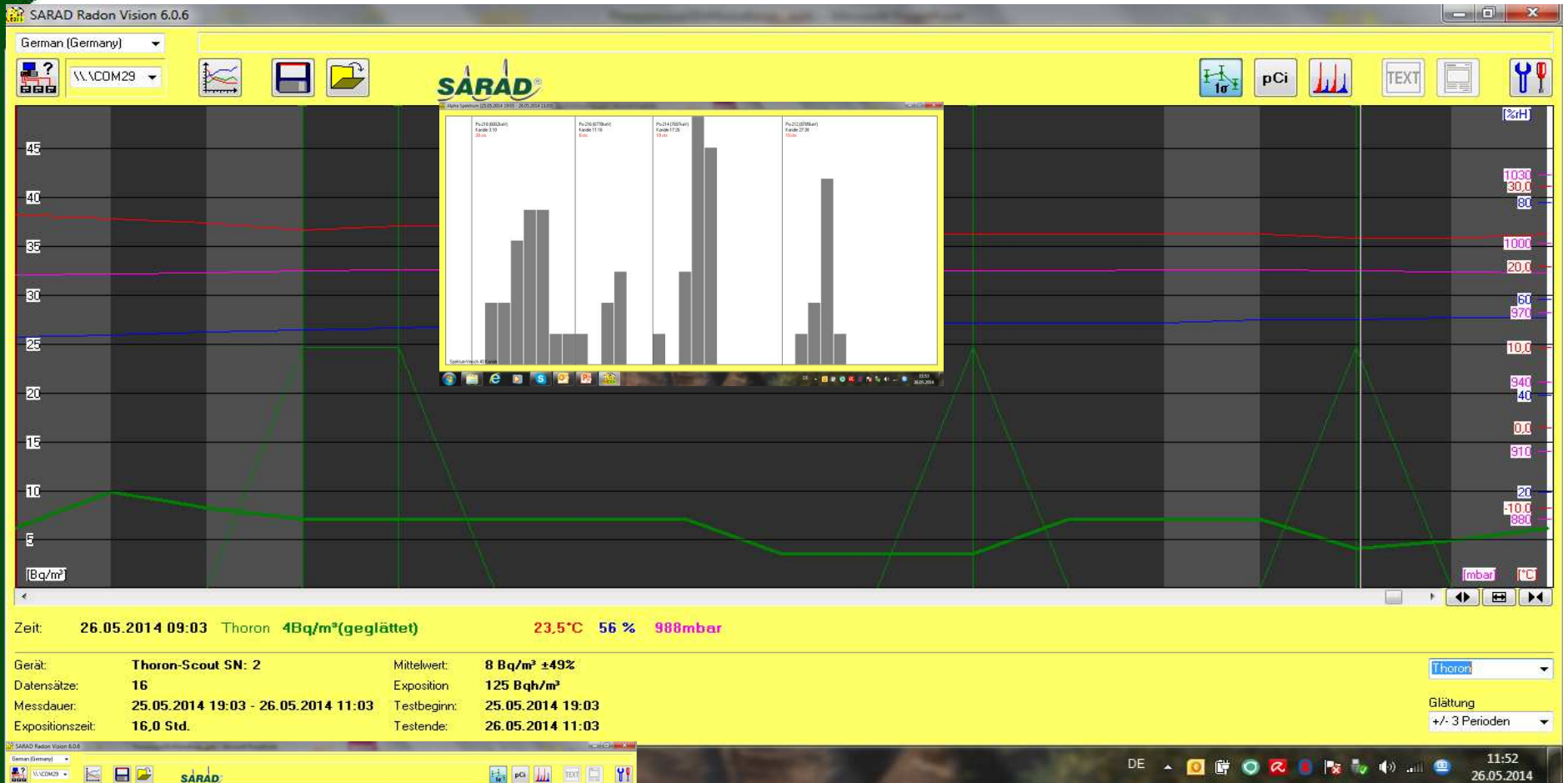
During interval tests Thoron gas source is attached / detached from the system circulation. There is no significant change in measurement response between system with active gas flow and system with diffusion principle of work. Both Radon and Thoron measurement results for TSC and reference device RTM1688 are equal.





Cellar
Wiesbadener Str. 10
01159 Dresden

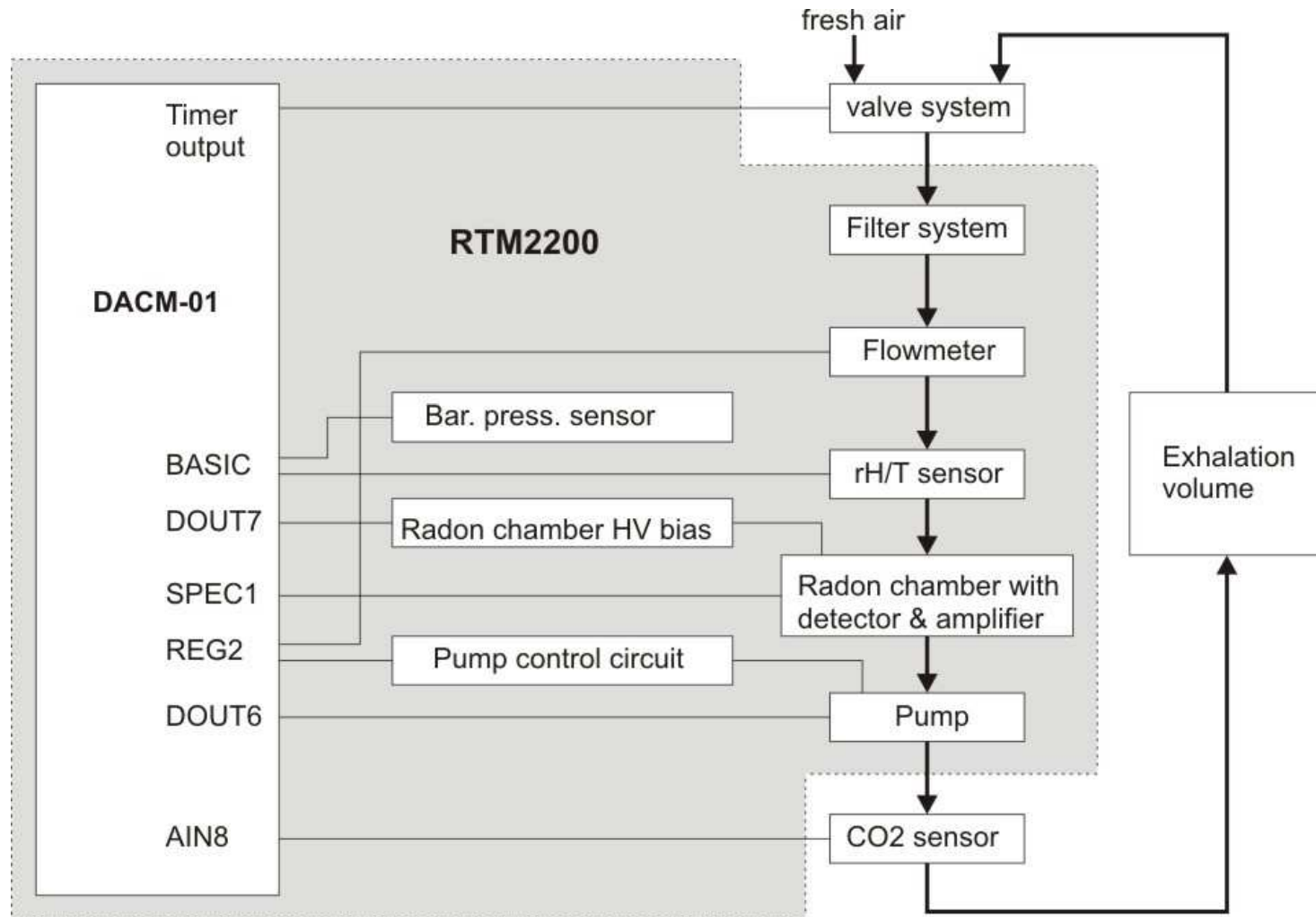




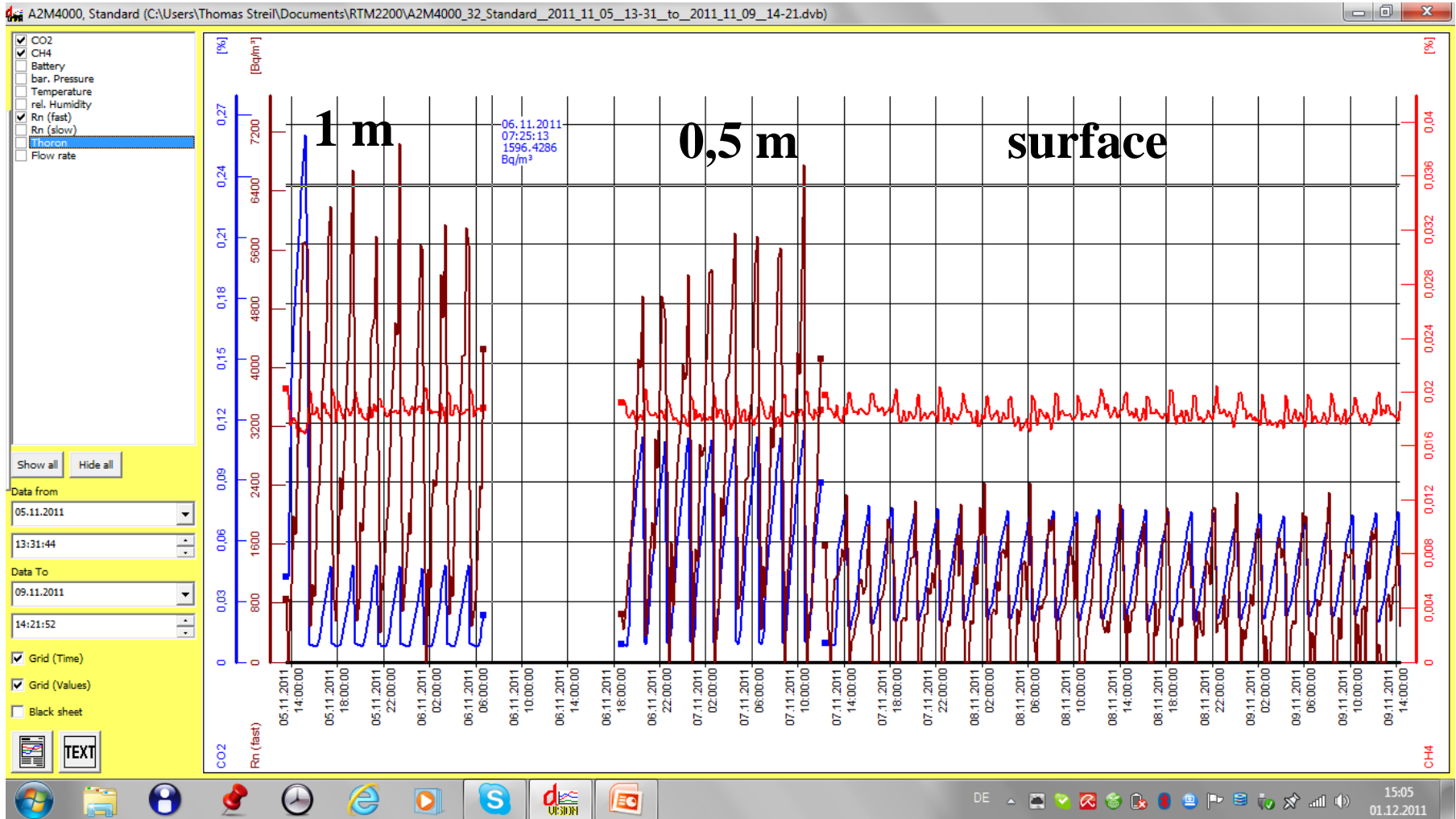
Room 203
DND Hotel
Niska Banja

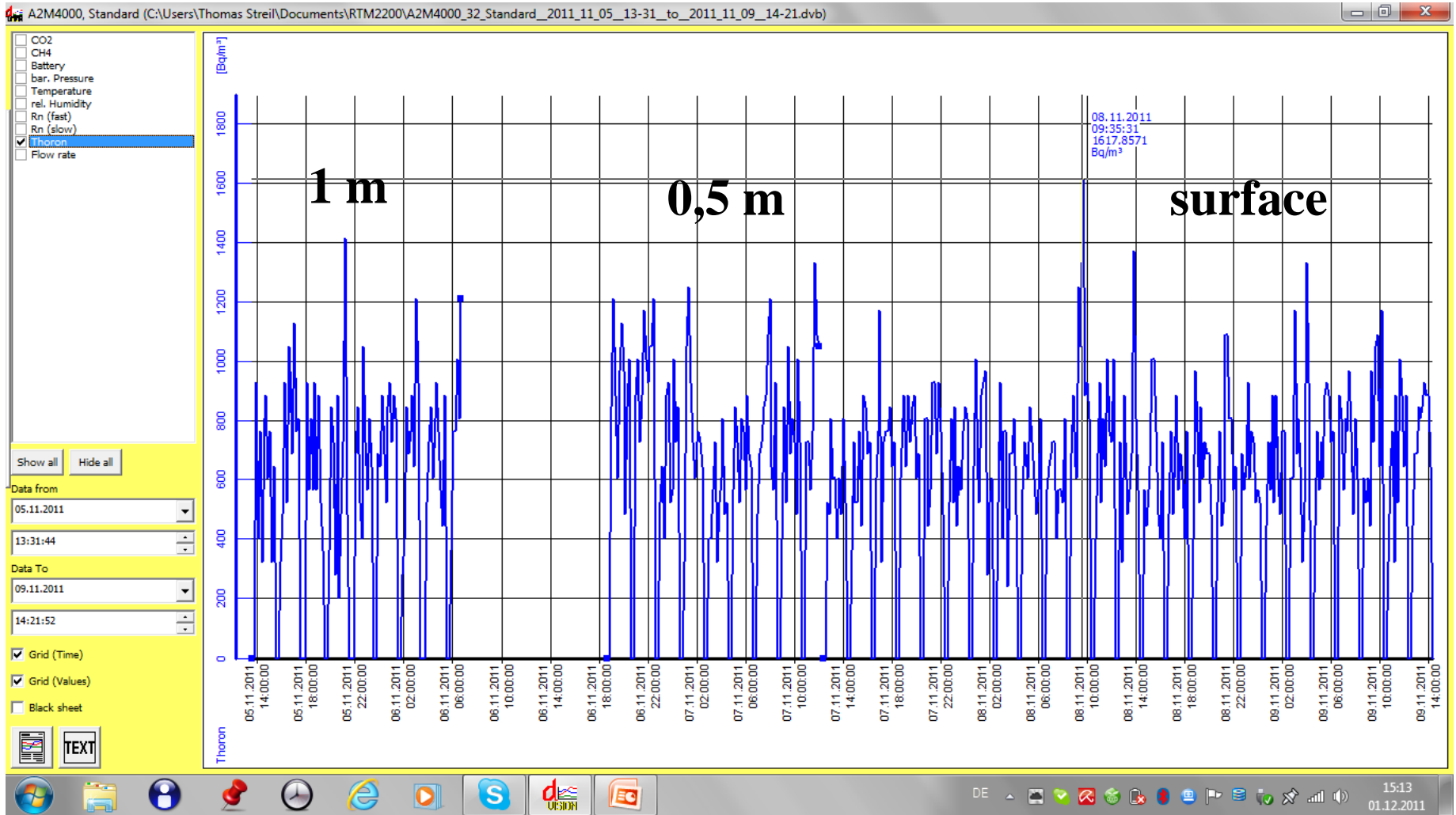


Soil gas flux extension with RTM2200





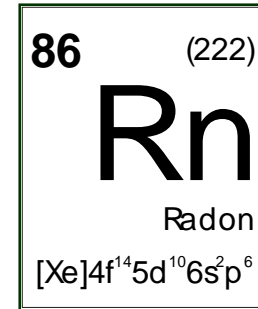
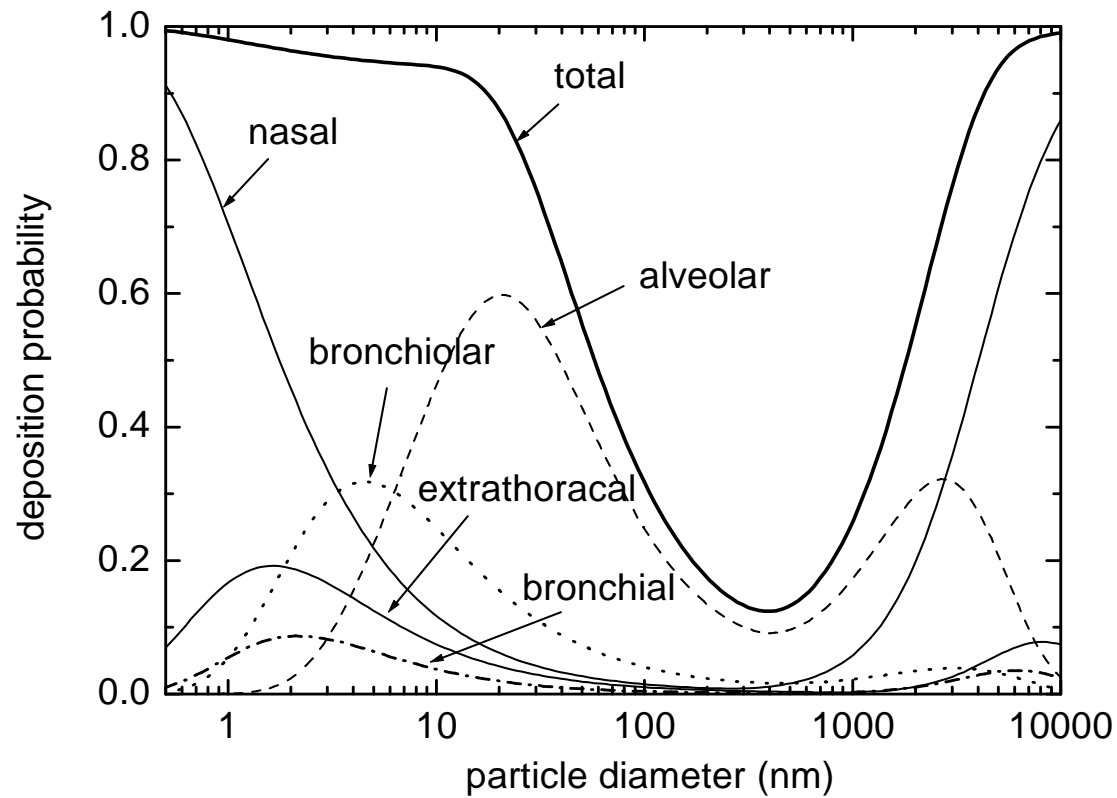




Gas sensors for Intergation in the A2M4000

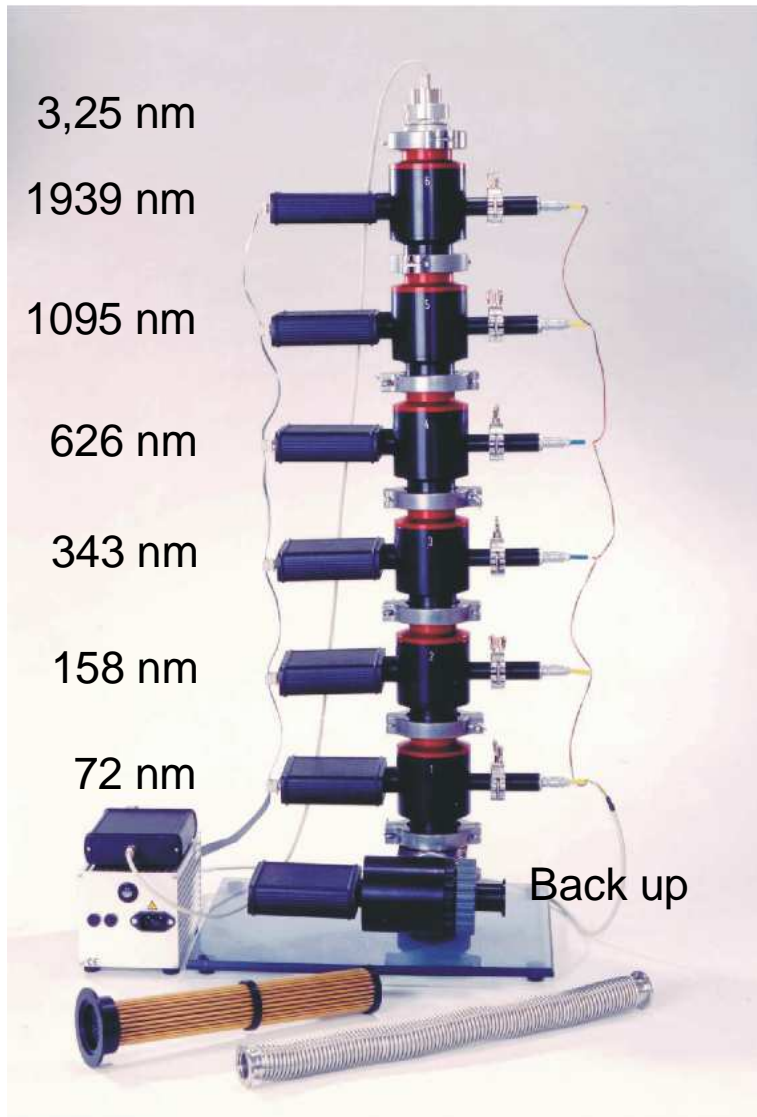
Gas	Measuring principle	Measurin range[ppm]
CH4	ZnO	500...10000
CO	ZnO	30...1000
H2	ZnO	50...5000
NH3	ZnO	10...100
H2S	ZnO	5...100
H2S	EC	0...50 bis 0...2000
PH3	EC	0...10 u. 0...2000
HCN	EC	0...50 bis 0...100
HCl/HBr	EC	0...20 bis 0...100
CL2	EC	0...20
NO2	EC	0...20
NO	EC	0...100 bis 0...5000
SO2	EC	0...20 bis 0...2000
CH4	NDIR	0...1000,10000, 10 %, 100%
CO2	NDIR	0...1000,10000, 10 %, 100%

Deposition and particle size



After: Porstendörfer & Zock (1996)

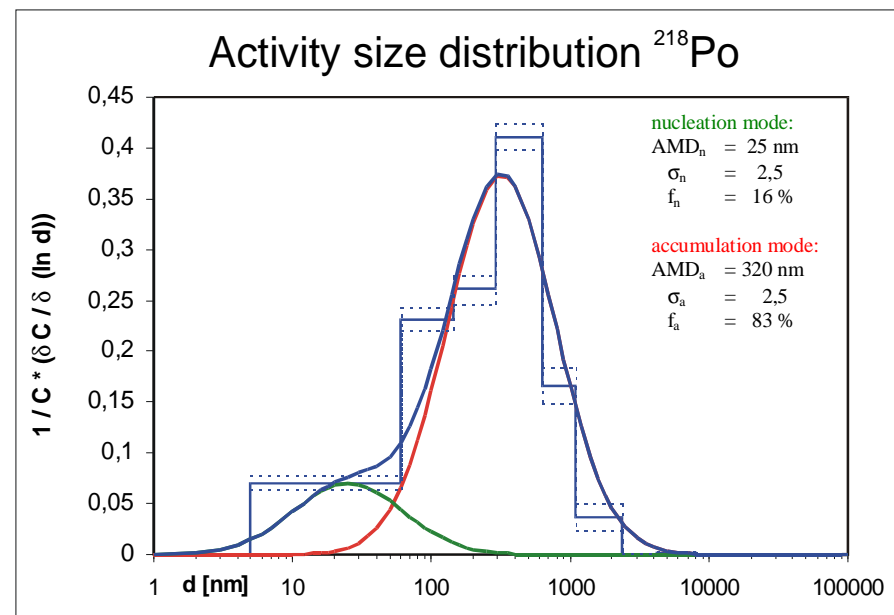
ASDA 02 Cascade impactor



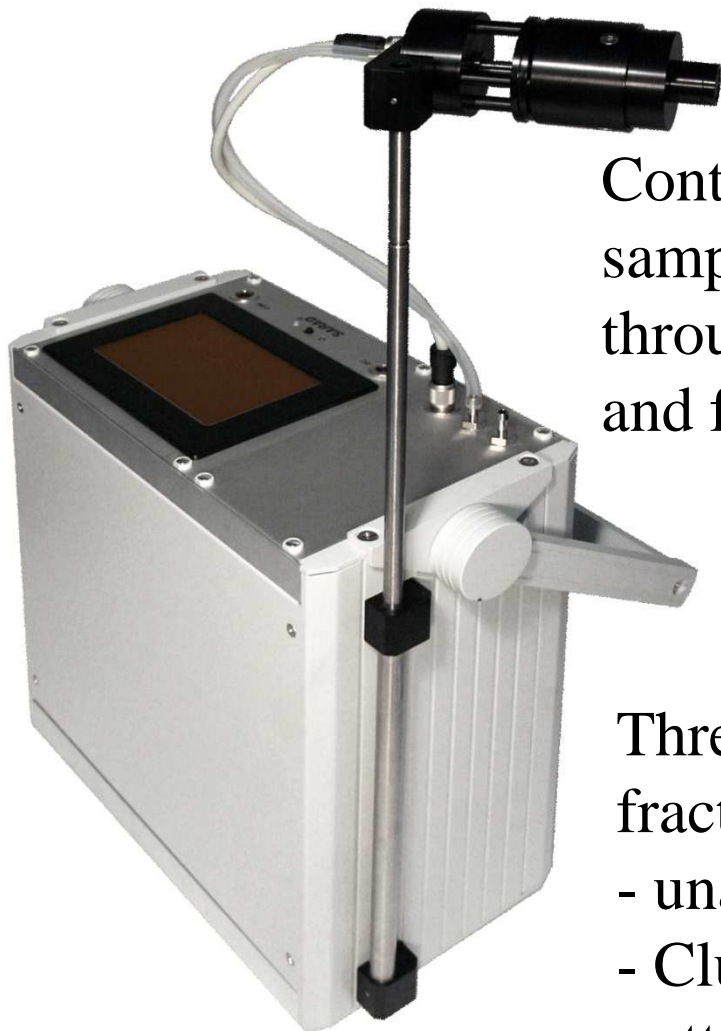
Activity size distribution

Unattached / attached fraction

Nuclide specific activity and size



EQF3220 – Radon, Thoron and daughters



Continuous
sampling
through screen
and filter

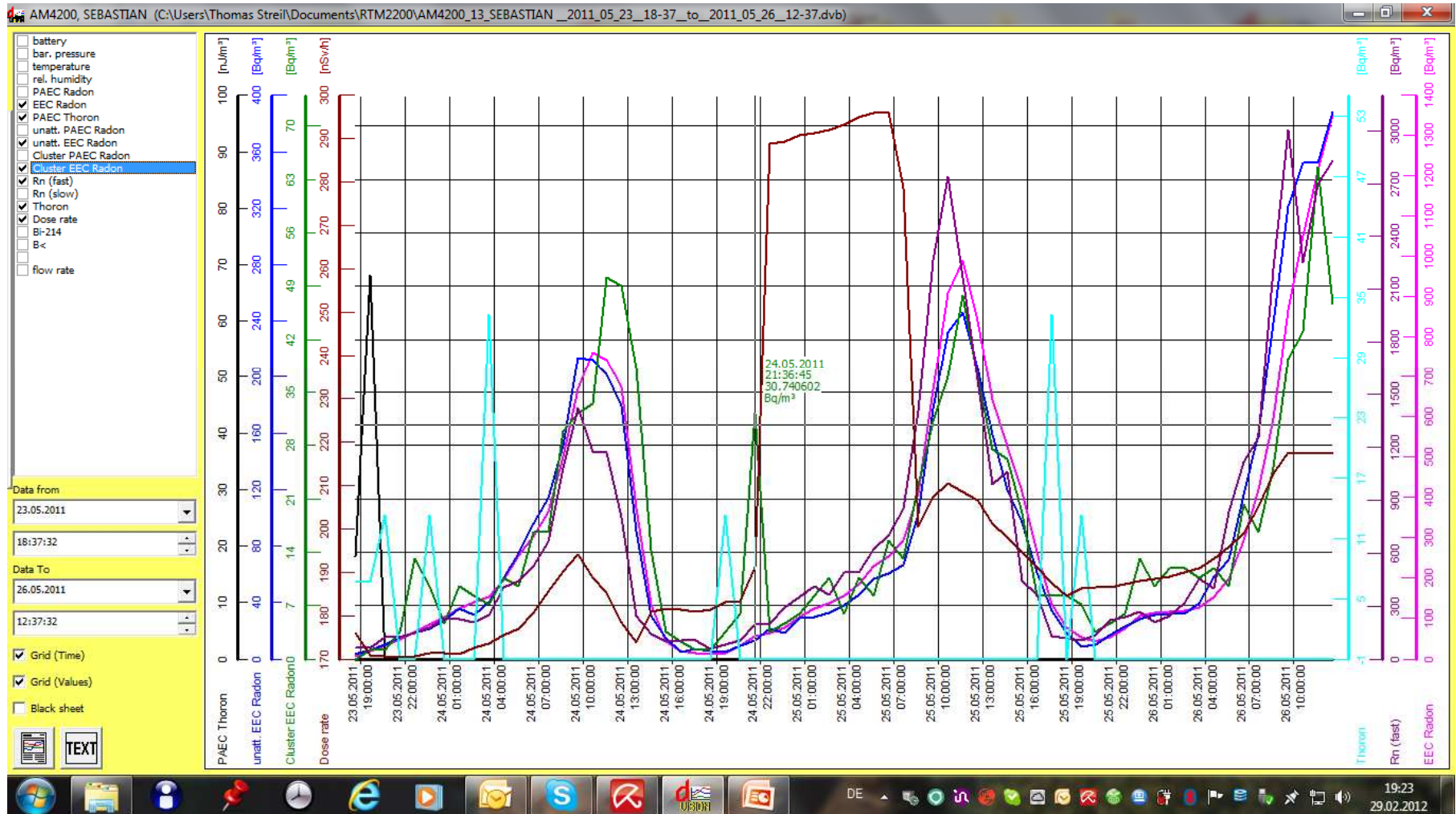
Removeable
sampling head for
free positioning
inside a room



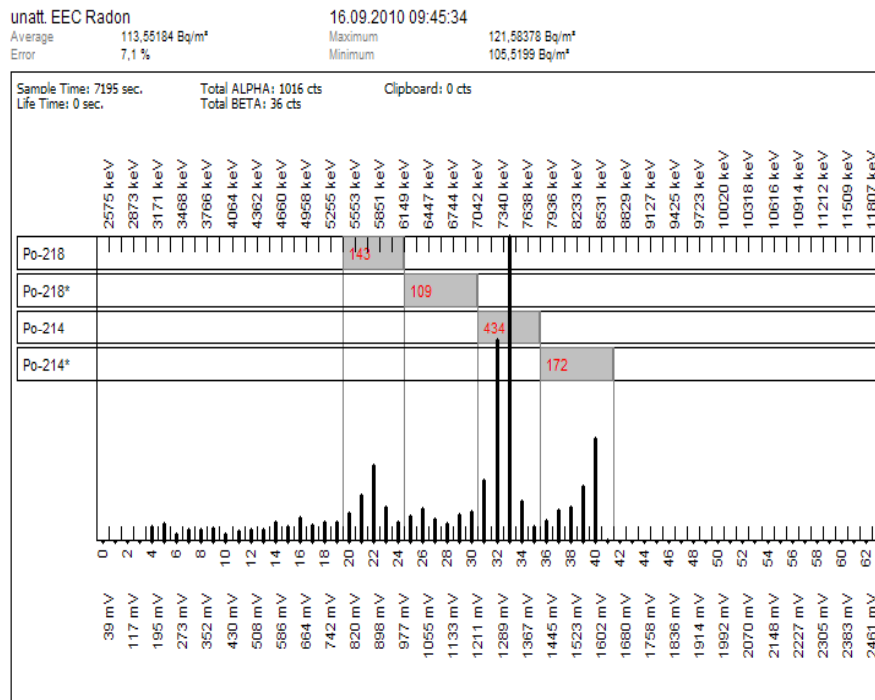
Three particle size
fractions
- unattached
- Cluster
- attached

Radon Intercomparison under natural conditions

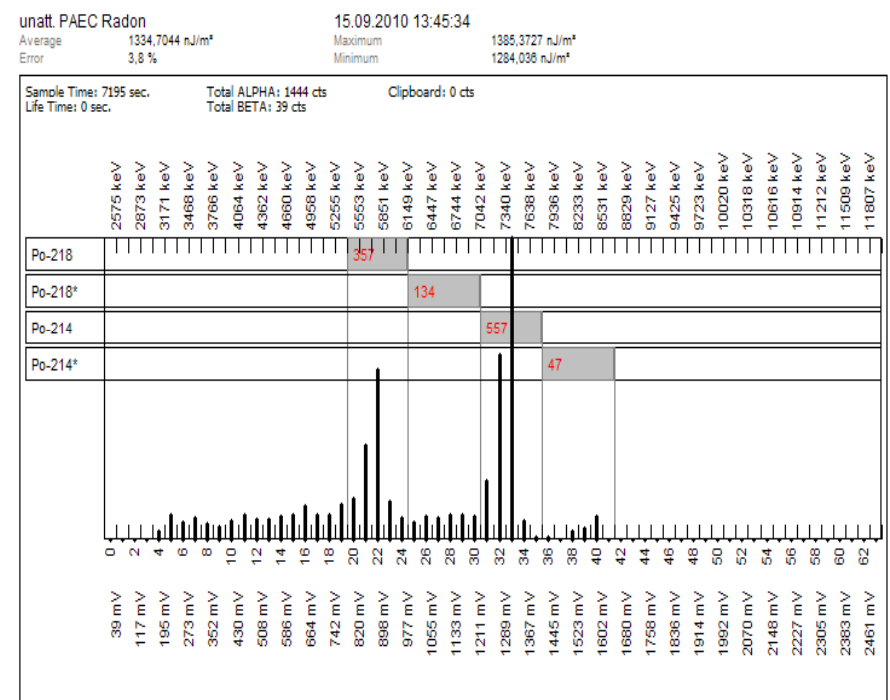
Rodrigo (Spain) May 2011



Screen spectra (unattached daughters)

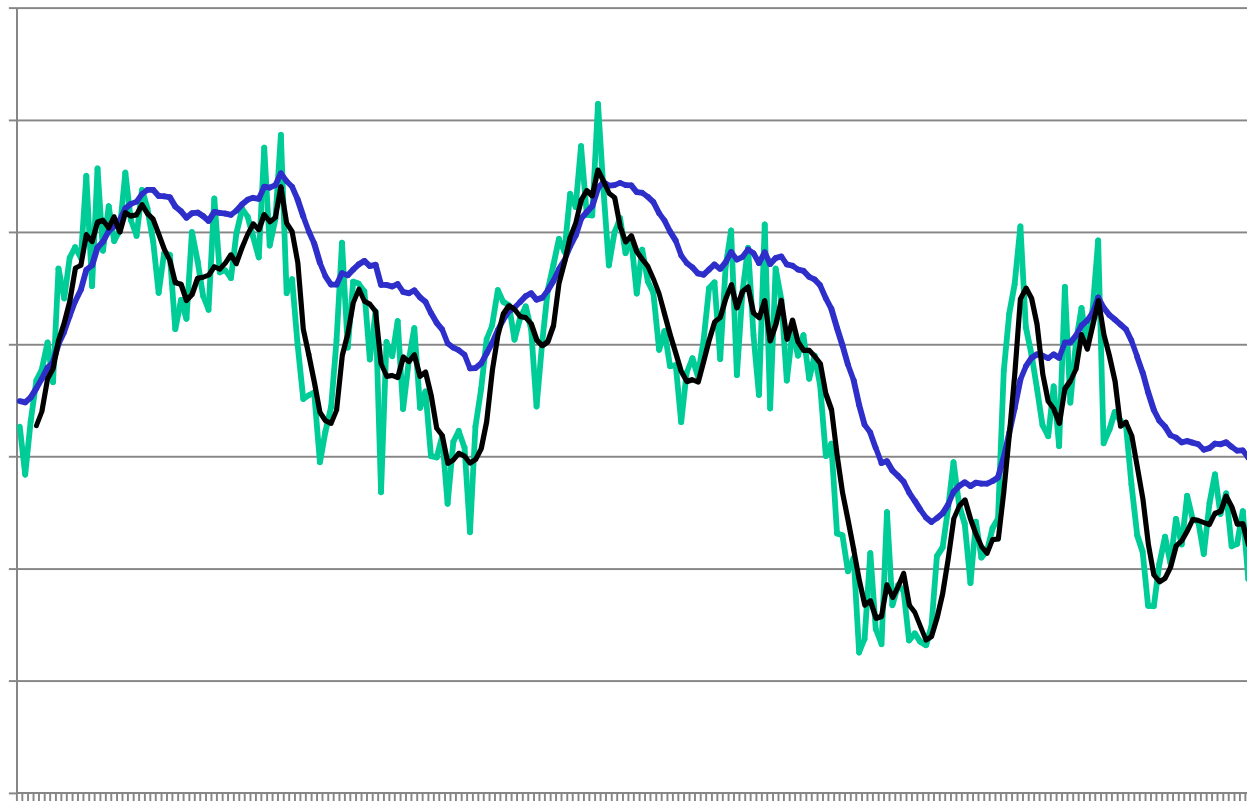


Cluster (during burning processes)

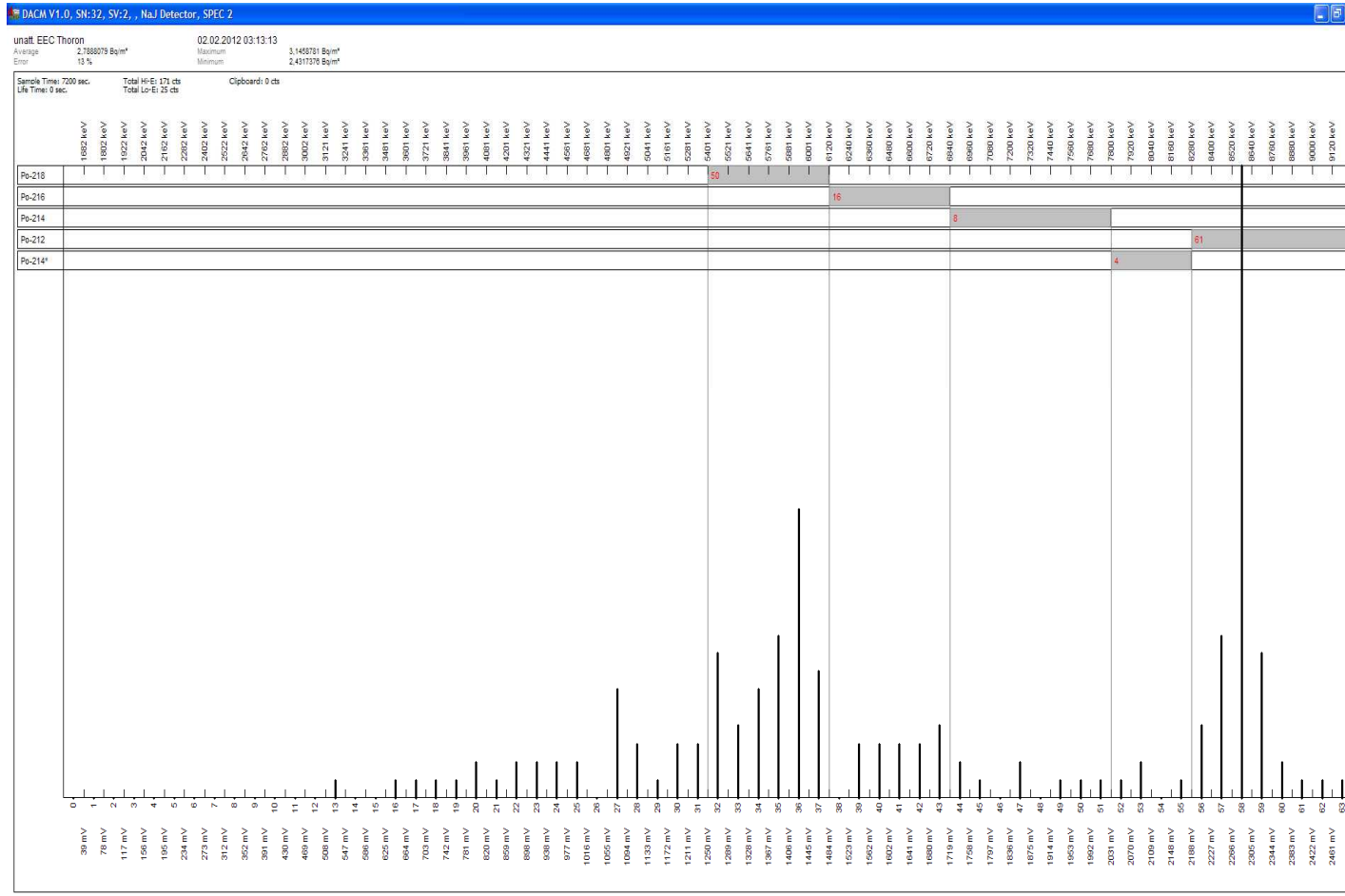


„Normal“ particle size distribution

Thoron PAEC Time resolution



Unattached Thoron measurement by EQF 3220





“Hazard-Detection and Management”

8th Dresden Conference
Organized by IGRS

