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

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2. The development of the Thoron-Scout
3. First results
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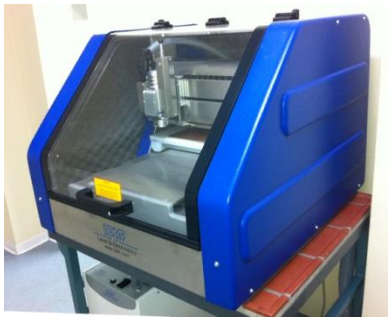
SARAD - Introduction

- **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

Radon and Radon/ Thoron instruments

RTM 1688 Radon/Thoron monitor
for any kind of Rn measurements (e.g. Soil gas-water measurements

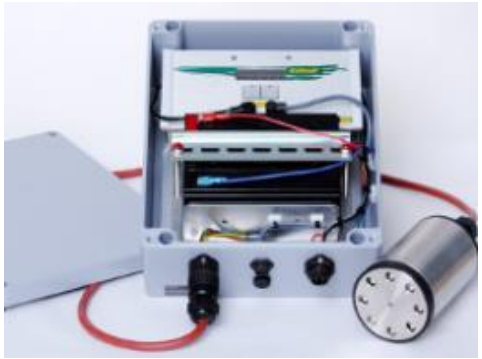
RadonScout PMT
High sensitivity

Doseman
Rn individual dosimeter

Indoorsensor
Rn indoor monitoring

RadonScout/ Plus
Rn long term measurement

RTM1688 Geostation
Air and soil gase
long term measurements for exreme conditions



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Radon progenies & radioactive aerosoles

EQF 3220
Particle size specific Rn/Th gas and dauther monitor

poCAMon new development
online air sampler (flow rate > 2lpm)

Myriam
Personal dosimeter for inhalation dose

EQF 3220
Rn/Th gas and dauther product monitor

Doseman Pro
Rn dauther product dosimeter

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Standard Applications Based on DACM Technology

poCAMon

RTM- 2200

EQF-3200, RPM- 2200

Based on DACM Data Acquisition and Control Module

EQF-3220

NucScout

A²M- 4000

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Why was it necessary to develop the ThoronScout

Up to now

various spectroscopy-based instruments available
(e.g. RTM 1688)

But

Pumps are necessary to draw the thoron gas fast enough into the measurement chambers.
(noise, vibration, high power consumption)


RTM1688
RSC+
TSC !!!

About Thoron

- Isotope Rn-220
- **half-live period: 55 s**
- emerge within the Thorium decay chain

→ high concentration in Th-232 enriched areas

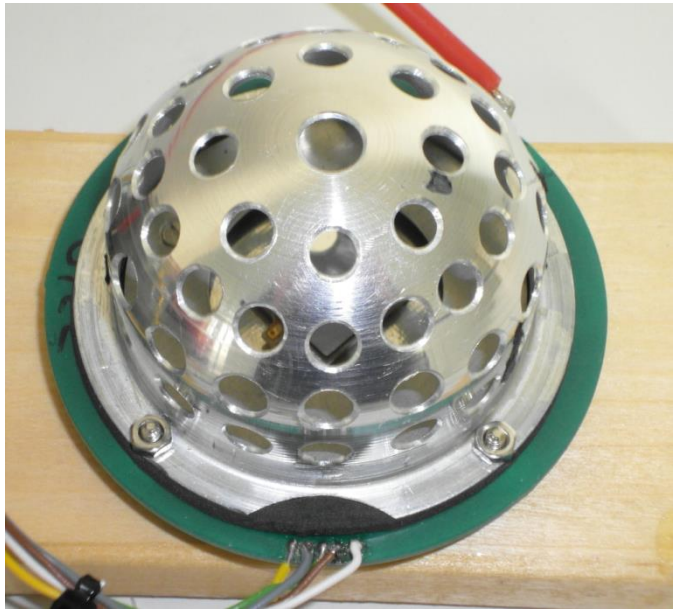
e.g. in clay, coal, monazite minerals

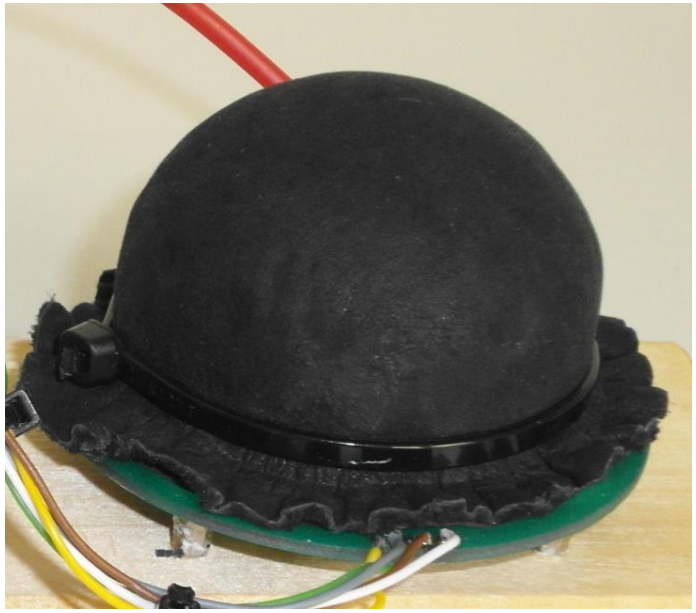
How to get the air fast enough into the measurement chamber?

The solution

perforated measurement chamber

Covered with a special treated leather for dust and light protection





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Fast diffusion of measurement gas in Thoron-Scout
the pros:

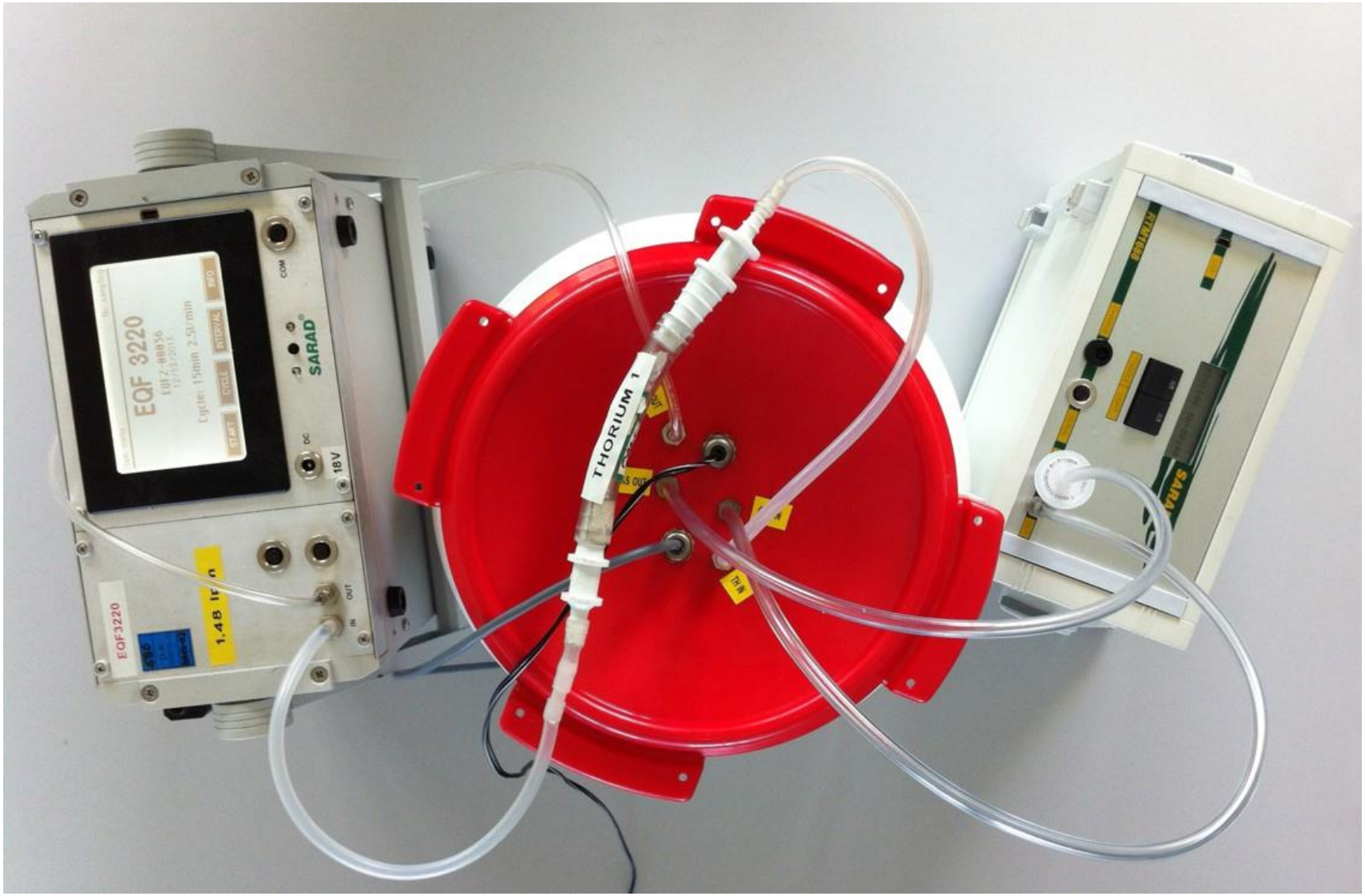
• No pump necessary!!
  ○ smaller power consumption
  ▪ longer measurement time
  ○ no vibrations
  ○ no noise
  ○ longer device reliability (no movable mechanical parts)

é 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



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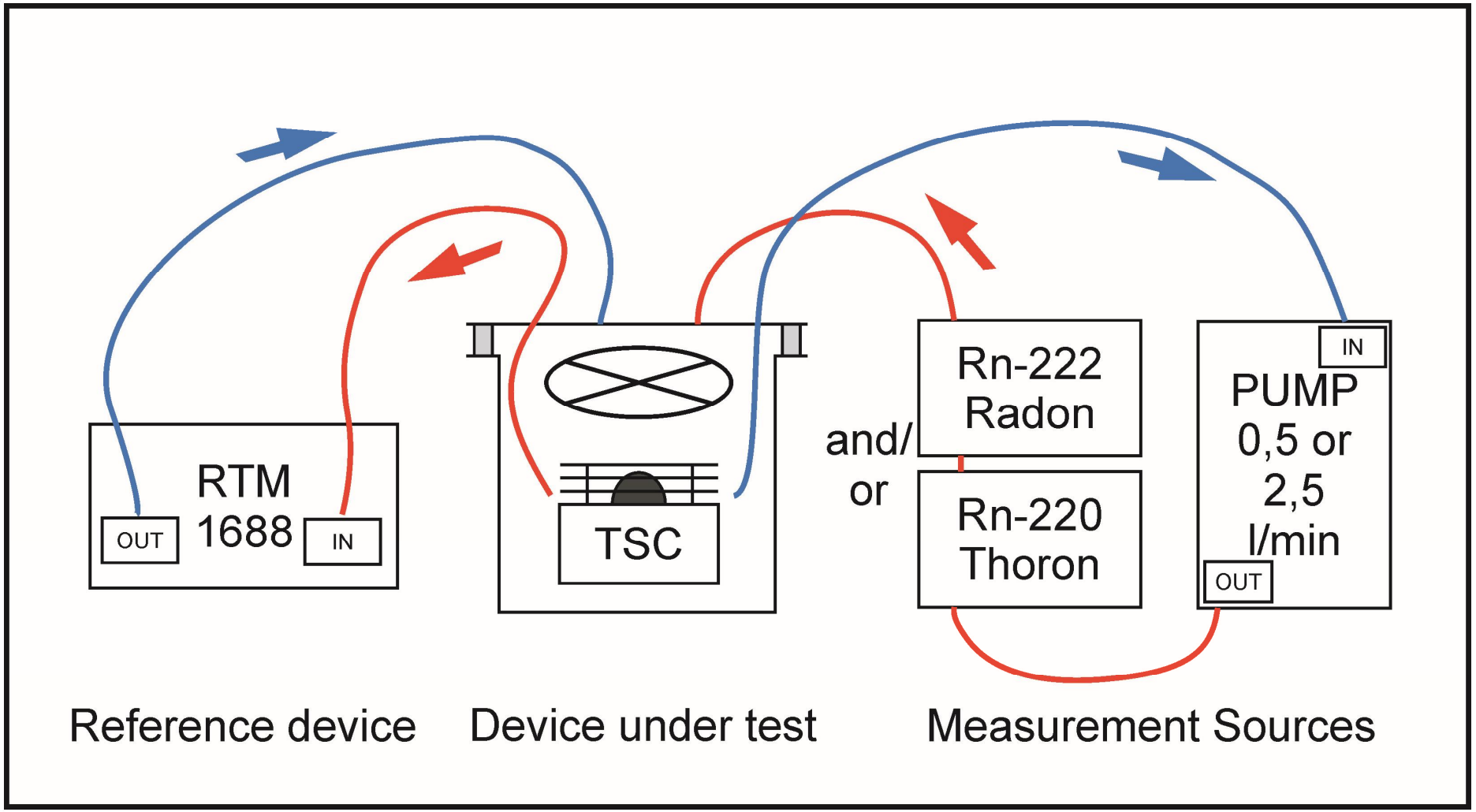
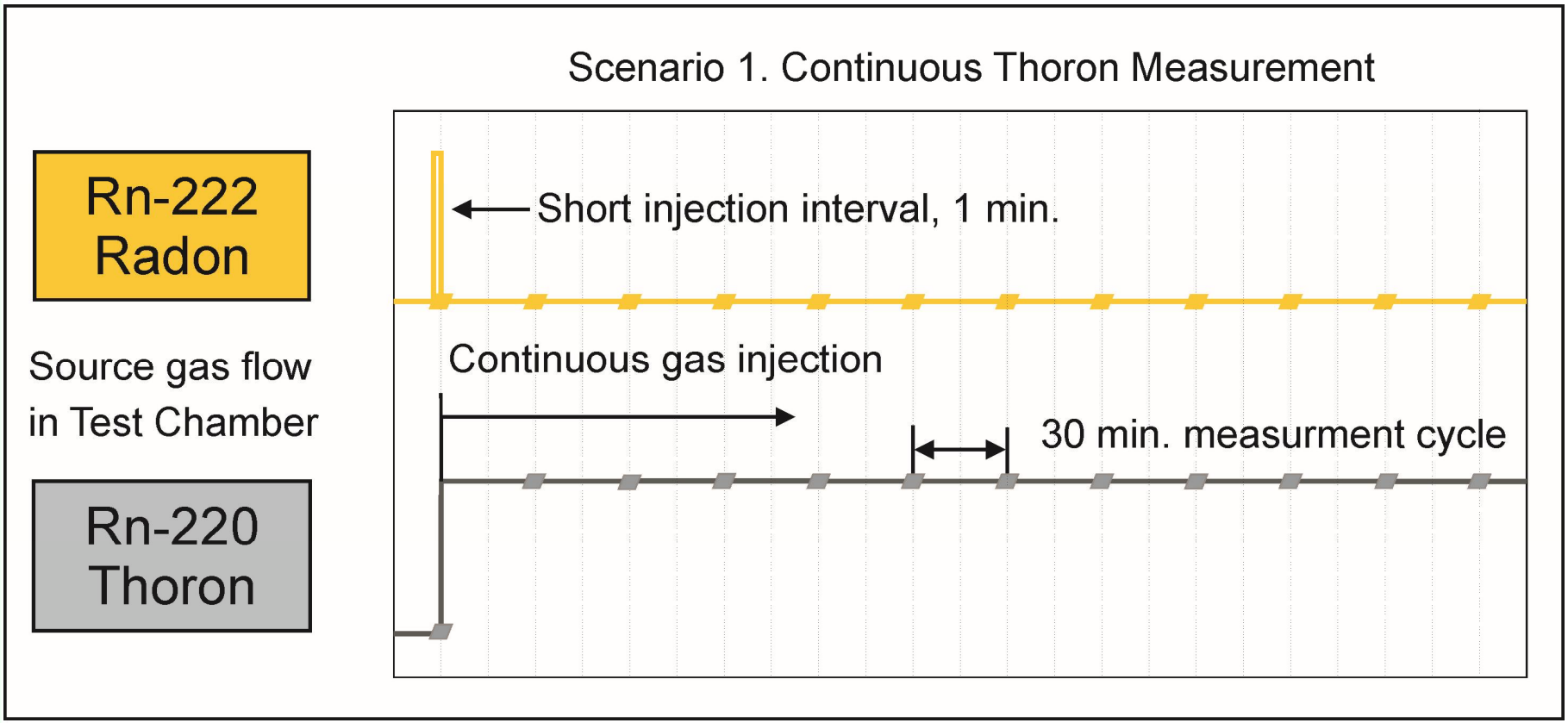
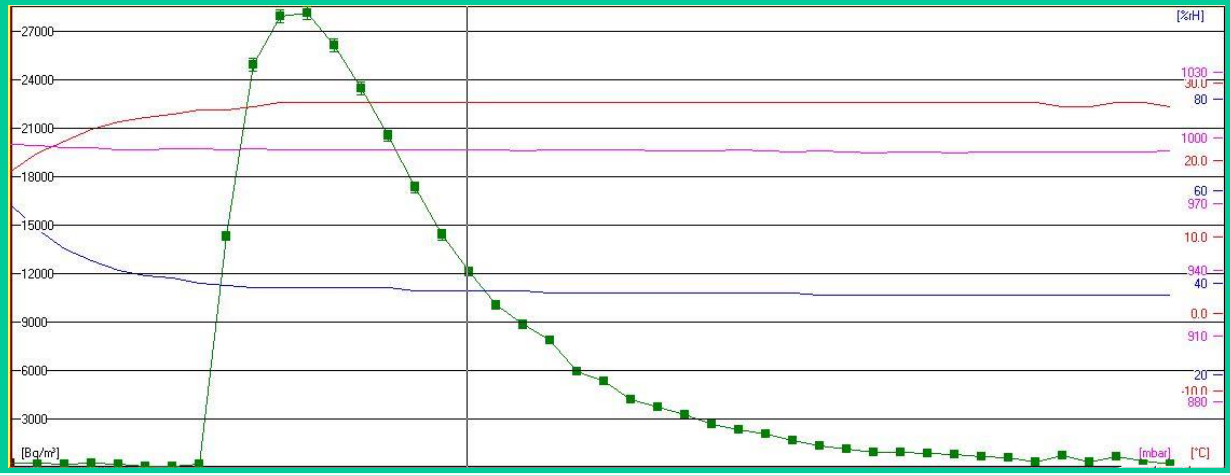
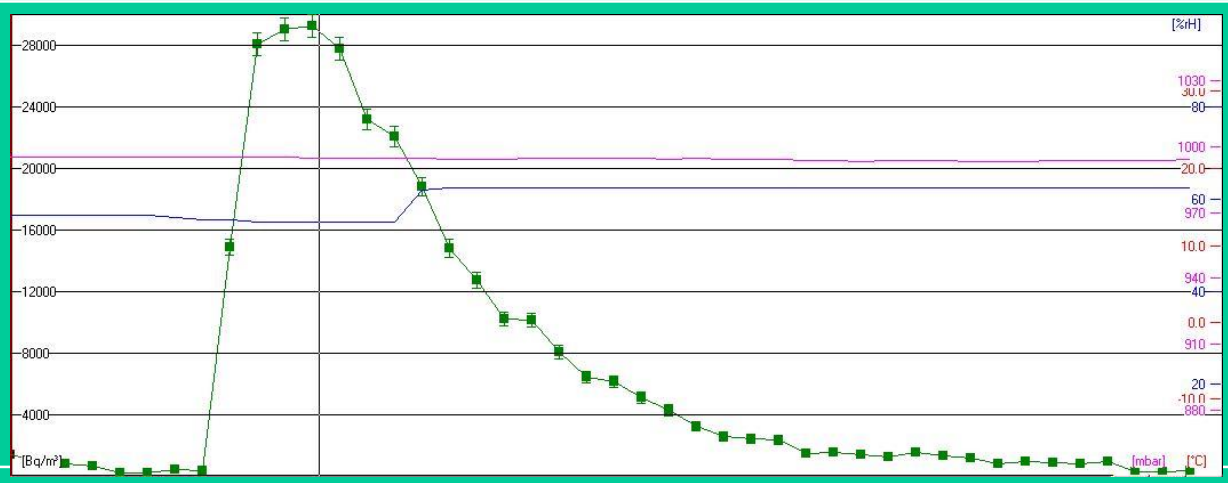

RTM
1688
OUT
IN
TSC
and/
or
Rn-222
Radon
Rn-220
Thoron
IN
PUMP
0,5 or
2,5
l/min
OUT
Reference device
Device under test
Measurement Sources


Scenario 1. Continuous Thoron Measurement
Rn-222
Radon
Short injection interval, 1 min.
Source gas flow
in Test Chamber
Continuous gas injection
30 min. measurment cycle
Rn-220
Thoron

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

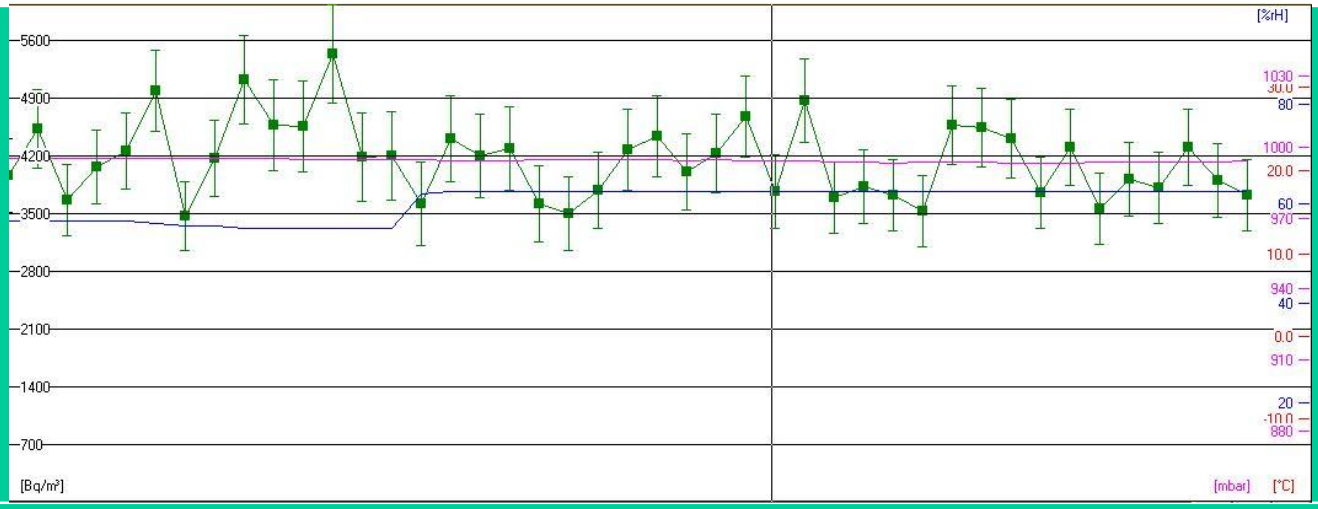


TSC

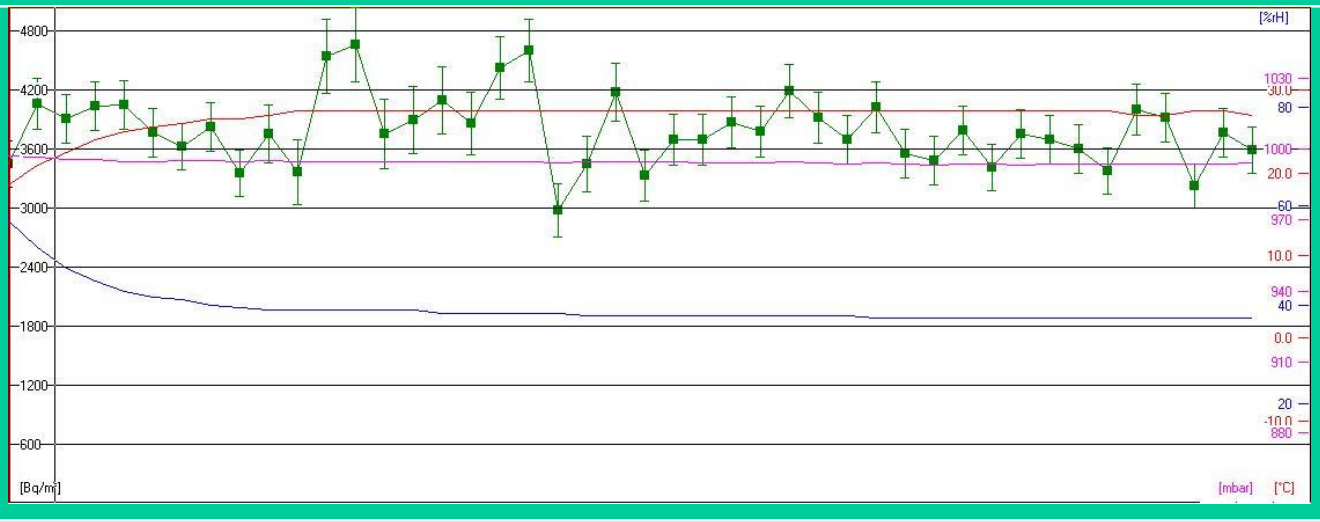


RTM1688

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

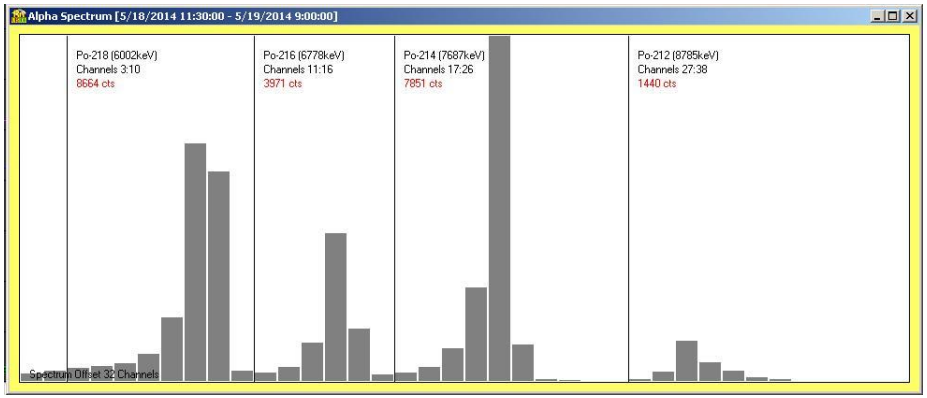


TSC



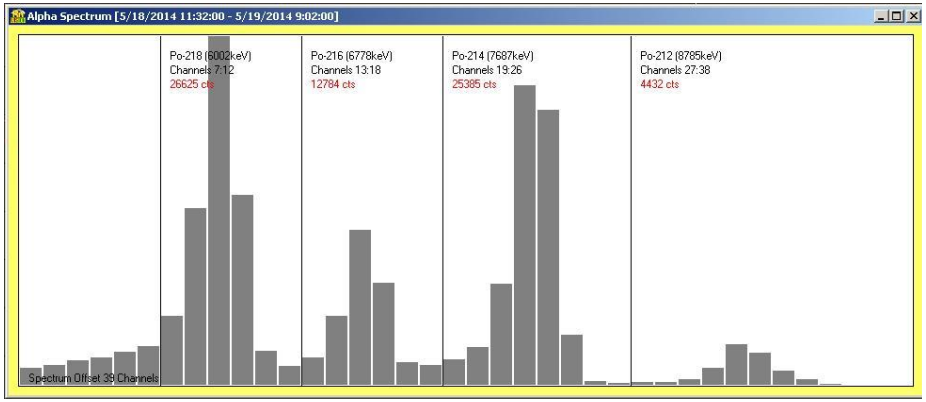
RTM1688

TSC



$Po218_{TSC}$(cts) / $Po218_{RTM1688}$(cts) = 8664 / 26625 = 0,325
$Po216_{TSC}$(cts) / $Po216_{RTM1688}$(cts) = 3971 / 12784 = 0,311
$Po214_{TSC}$(cts) / $Po214_{RTM1688}$(cts) = 7851 / 25385 = 0,309

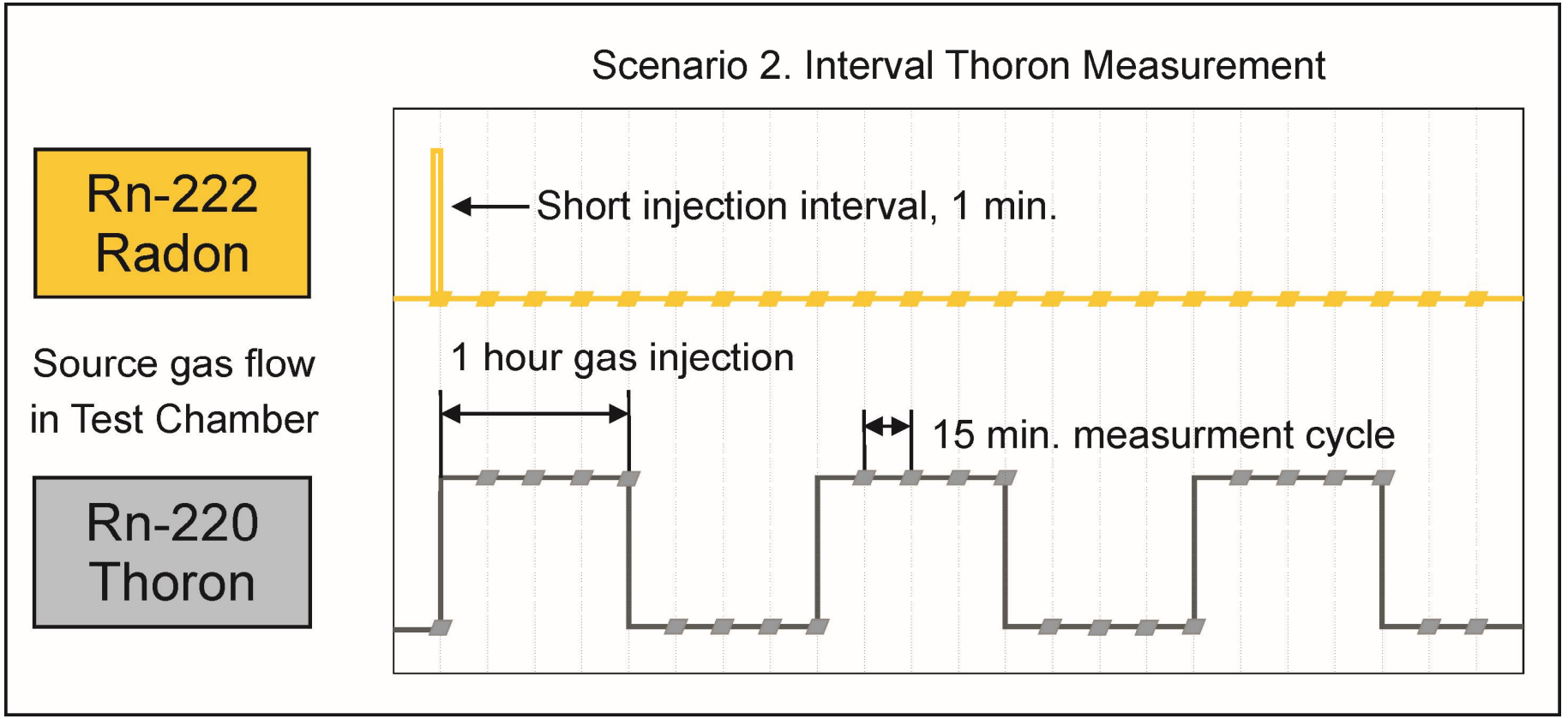
RTM1688



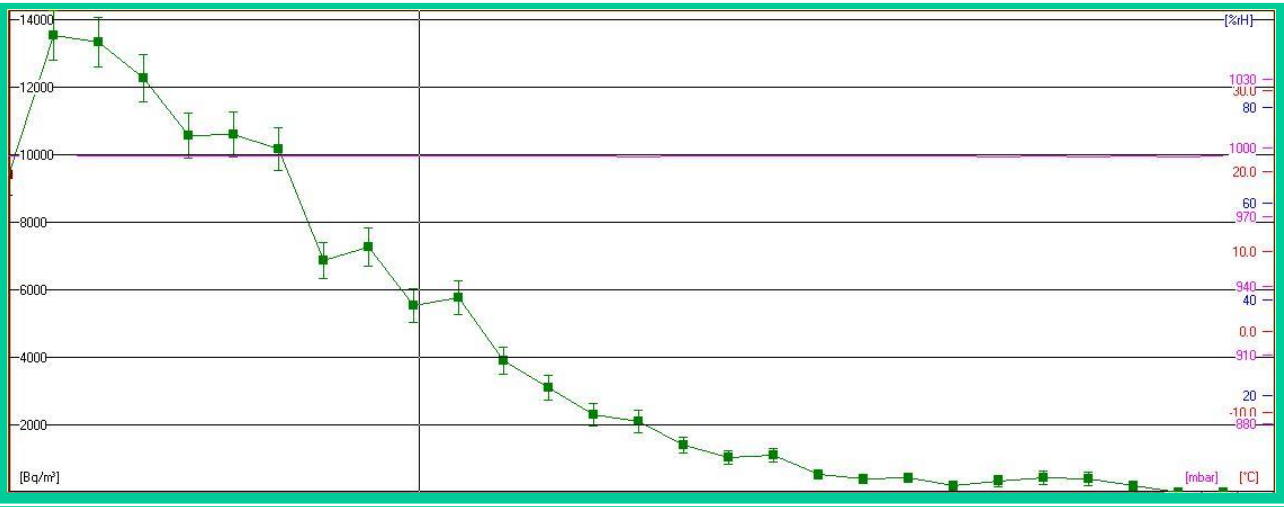
$Po212_{TSC}$(cts) / $Po212_{RTM1688}$(cts) = 1440 / 4432 = 0,325

$Po21X_{TSC}$(cts) / $Po21X_{RTM1688}$(cts) å constant !!

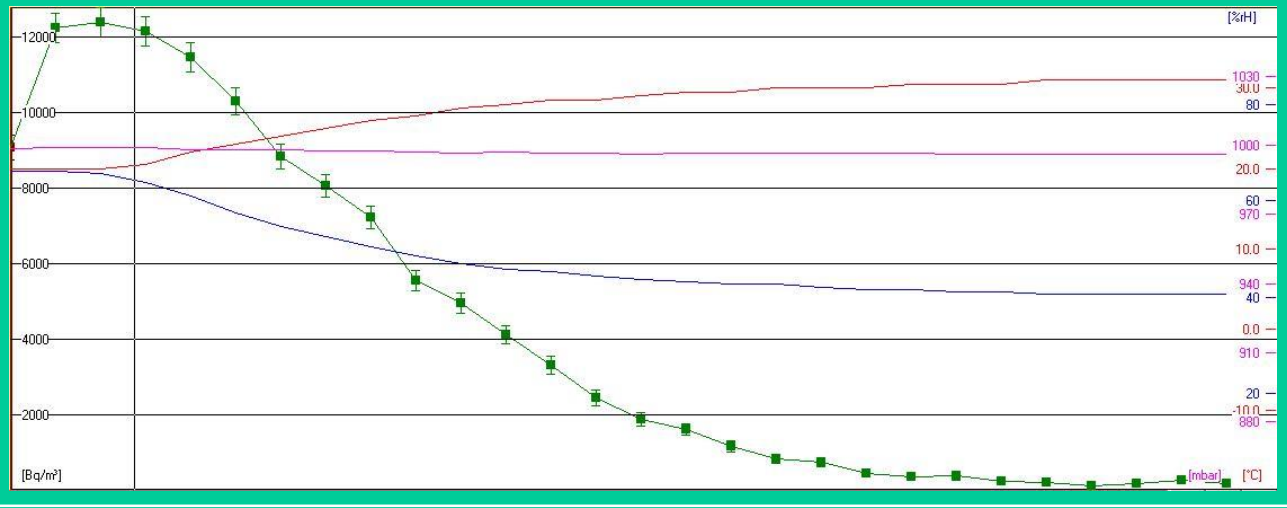
The ratio between counts Toron Scout and counts RTM1688 for all dauthers is nearly constant.


Scenario 2. Interval Thoron Measurement
Rn-222
Radon
Source gas flow
in Test Chamber
Rn-220
Thoron
Short injection interval, 1 min.
1 hour gas injection
15 min. measurment cycle

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

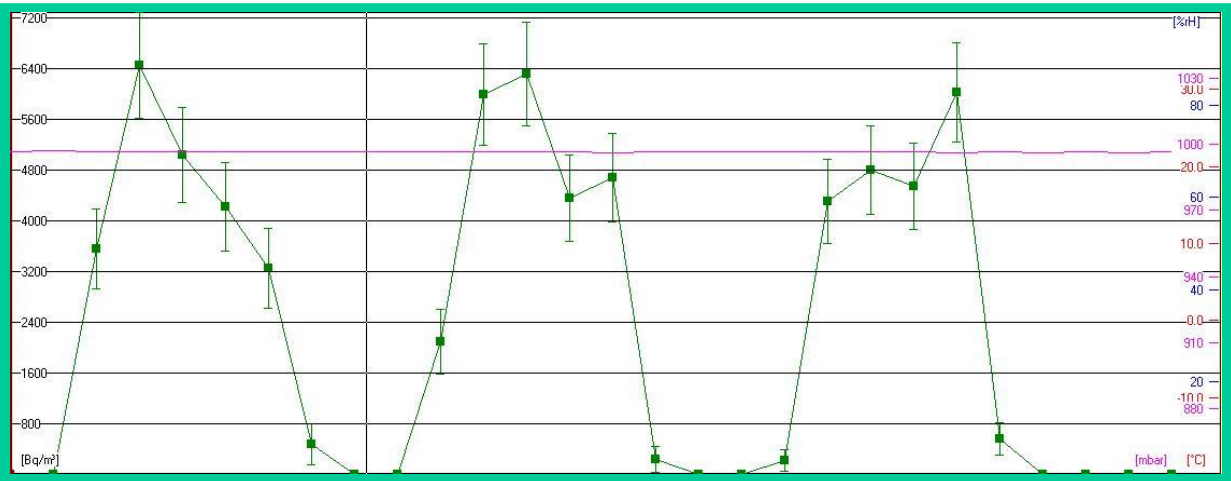


TSC

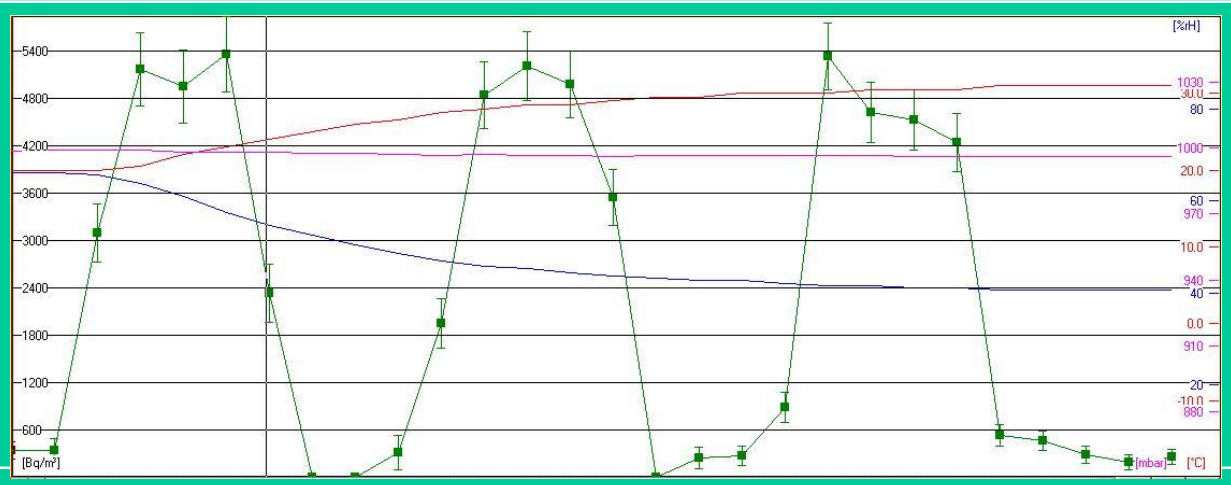


RTM1688

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

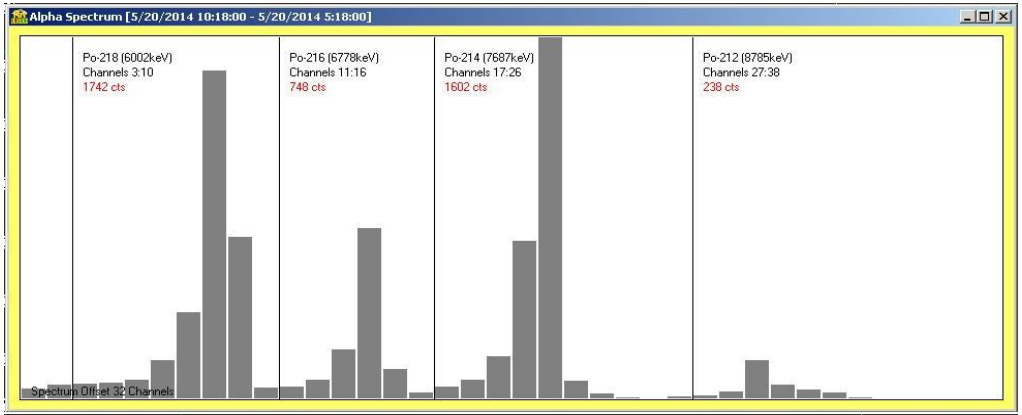


TSC



RTM1688

TSC

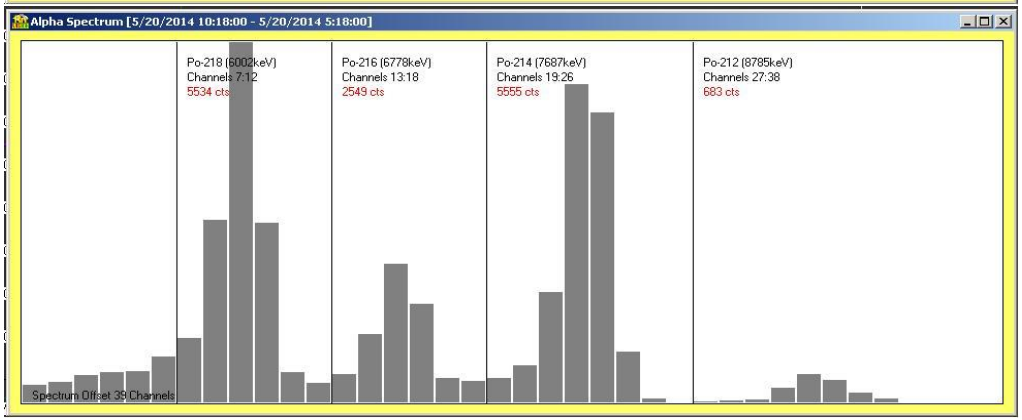


$Po218_{TSC}$(cts) / $Po218_{RTM1688}$(cts) = 1742 / 5534 = 0,315

$Po216_{TSC}$(cts) / $Po216_{RTM1688}$(cts) = 748 / 2549 = 0,293

$Po214_{TSC}$(cts) / $Po214_{RTM1688}$(cts) = 1602 / 5555 = 0,288

RTM1688



$Po212_{TSC}$(cts) / $Po212_{RTM1688}$(cts) = 238 / 683 = 0,348

$Po21X_{TSC}$(cts) / $Po21X_{RTM1688}$(cts) å constant !!

The ratio between counts Toron Scout and counts RTM1688 for all dauthers is nearly constant.

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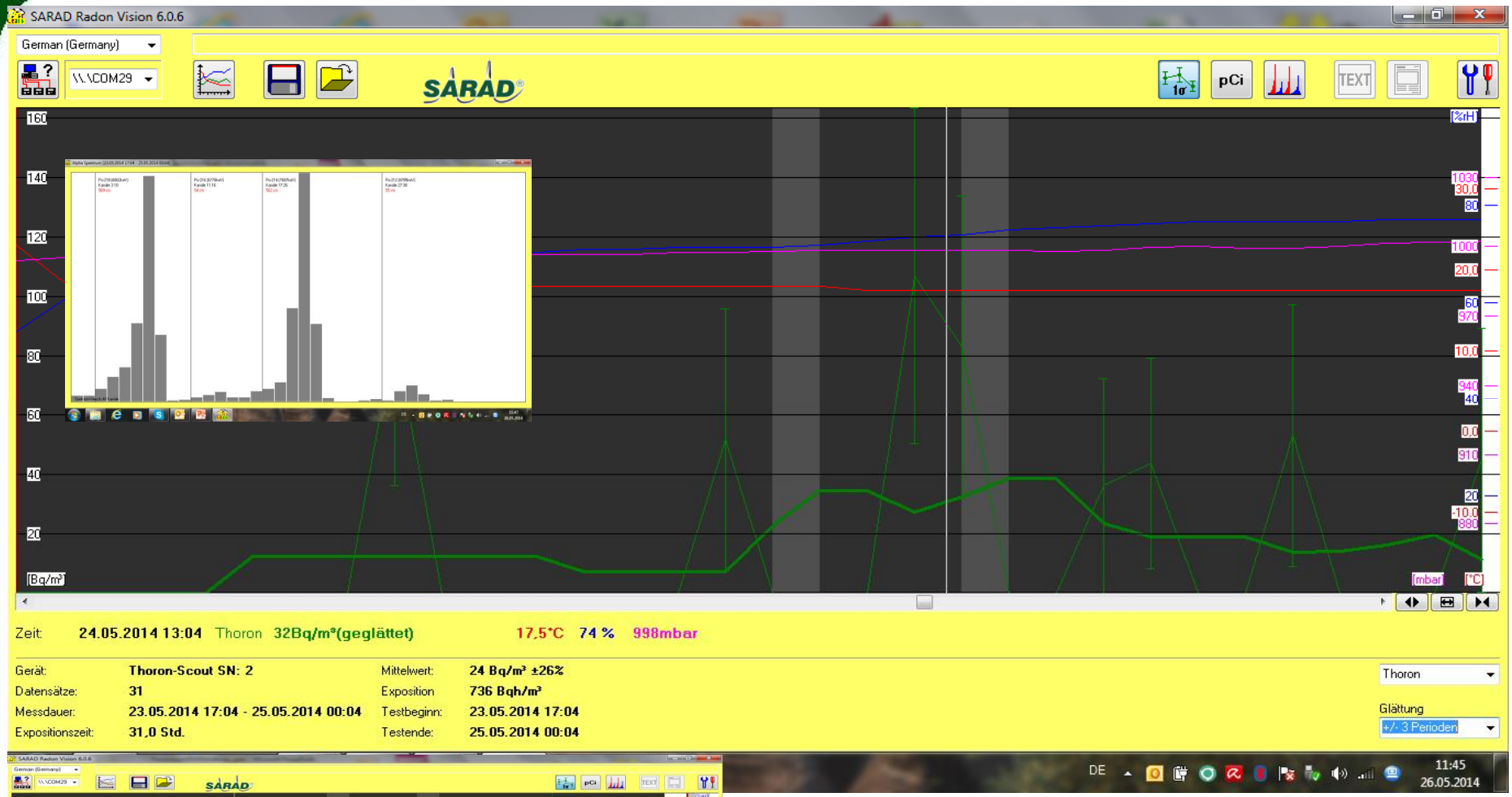

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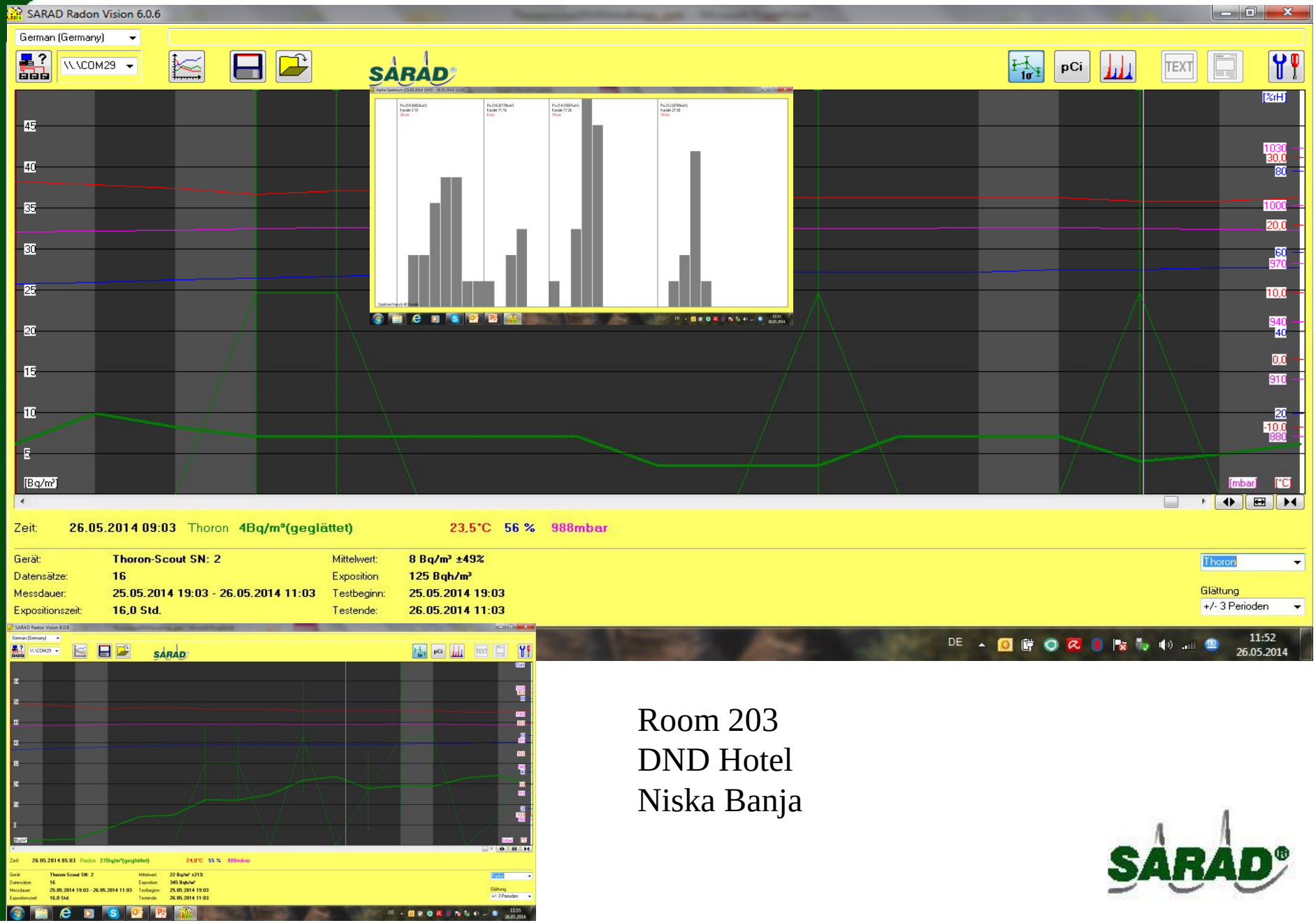

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Conclusion

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

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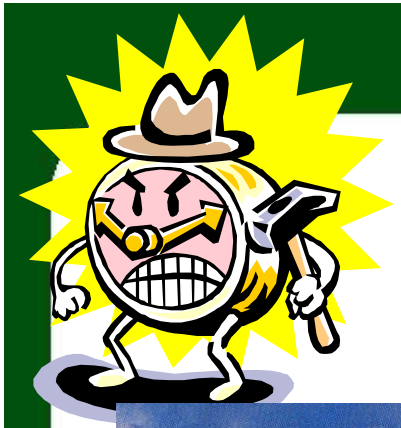

ñHazard-Detection and Managementò

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