Quality and Technology
- Made in Germany -

TRACERLAB GmbH

Aachener Str. 1354

50859, Koeln,

Germany

Tel.: +49 – (0) 2234 - 942397
Fax.: +49 – (0) 2234 - 942398

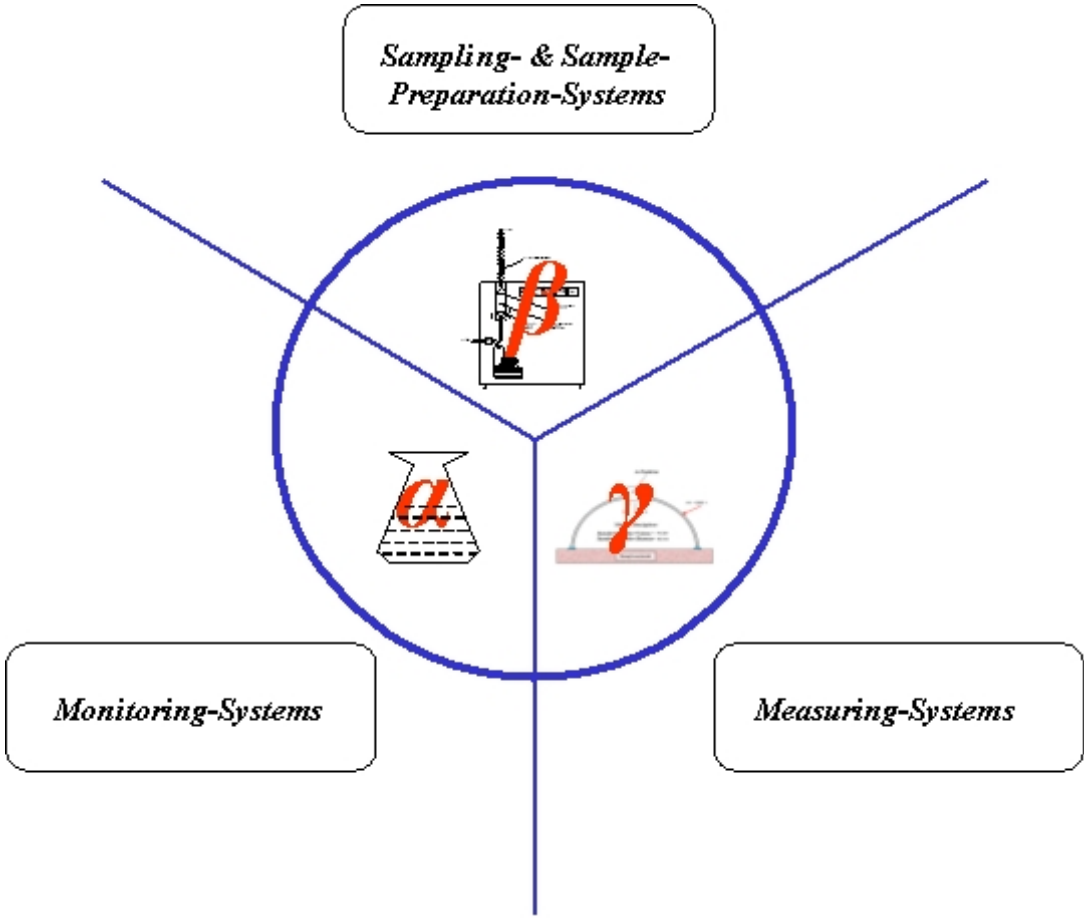
E-mail:

asktracerlab@tracerlab.com

Internet: www.tracerlab.com

TRACERLAB

offers a wide range of development, engineering and production of instruments, such as sampling-, sample preparation- and measuring systems, mainly to be used in the field of the Environmental- and Radiation Protection, including the instruments for the determination of natural radiation, Radon/Thoron and its Progenies, in the air, in the soil or in water.



- Environmental-Protection
- Radiation-Protectio
- Nuclear Engineering
- Helath-Physics

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Presentation of the New Generation of Radon – Monitors – 2014-06
All of the presented single- or dual-channel Instruments are equipped with an intelligent Alpha-Spectroscopy-System with integrated MCA, 256 channel, ADC, Pre- and Main-Amplifier

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

ERS/RM-1000/250
Small Size and light weight
Radon / Thoron Gas Monitor

The ERS/RM-1000/250 is an active and direct reading Electrostatic Radon/Thoron Gas-Monitor, has a counting-chamber of 250 ml volume and is made for the determination of the Radon/Thoron-Gas Concentration in the air, or from the soil.
The ERS/RM-1000/250 is a self contained instrument with all elements of an intelligent data collection with an alpha-spectroscopy-system.
The standard version of the ERS/RM-1000/250 has a 4-line LCD and the advanced version of ERS/RM-1000/250 has a Panel-TPC for the communication, evaluation of results and data-storage

ERS/RM-1000/250
operation by diffusion-mode,
or by pumping-mode

ERS/RM-1000/250 - Radon / Thoron Gas Monitor
Method of operation - Facts and Definitions

The ERS/RM-1000/250 is an active and direct reading Radon/Thoron Gas-Monitor.
It is operating as an Electrostatic-Radon-Sampler with a metallic hemisphere / counting-chamber of 250 ml volume and a positive High-Voltage of 3 kV connected to the metallic hemisphere.
An Alpha-Sensitive Detector (Canberra PIPS-Detector) is built-in isolated on negative potential in the counting-chamber.
Radon containing ambient air is entering the counting chamber by using the diffusion-mode through a sintermetal-air-inlet-filter with an active diameter of 70 mm.
The other method of operation is by using the pumping mode.
Radon containing ambient air, or soil-gas is sucked by the internal air-suction pump with an airflow-rate of appr. 120 l/h through an air-inlet filter into the counting chamber.
The intelligent data collection with an alpha-spectroscopy-system, MCA with 256 channels, ADC, Pre- and Main-Amplifier is made for the collection of Po-218 for the determination of Radon and Po-216 for the determination of Thoron.

Operational dimensions and weight: 325 x 255mm, x 135 mm high, appr. 8 Kg
Electric power supply: Li-Ion-Battery, 14,4 V / 8,7 Ah, incl. charger.
Runtime without AC-line connection to the charger: > 12 h

ERS-2-S
Radon / Thoron Gas Monitor

The ERS-2-S is an active and direct reading Electrostatic Radon/Thoron Gas-Monitor, has a counting-chamber of 2.5 l volume and is made for the determination of the Radon/Thoron-Gas Concentration in the air, from the soil or from materials, e.g. for the determination of the Exhalation-Rate by using the special application-software.
The ERS-2-S is a self contained instrument with all elements of an intelligent data collection with an alpha-spectroscopy-system.
The standard version of the ERS-2-S has a 4-line LCD and the advanced version of ERS-2-S has a Panel-TPC for the communication, evaluation of results and data-storage.

ERS-2-S, advanced version with the Panel-TPC operation by diffusion-mode, or by pumping-mode

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

ERS-2-S - Radon / Thoron Gas Monitor

ERS-2-S, standard version with the 4-line LCD, operation by diffusion-mode

ERS-2-S, standard version with the 4-line LCD, operation by pumping-mode

ERS-2-S - Radon / Thoron Gas Monitor
Method of operation - Facts and Definitions

The ERS-2-S is an active and direct reading Radon/Thoron Gas-Monitor.
It is operating as an Electrostatic-Radon-Sampler with a metallic hemisphere / counting-chamber of 2,5 l volume and a positive High-Voltage of 4 kV connected to the metallic hemisphere.
An Alpha-Sensitive Detector (Canberra PIPS-Detector) is built-in isolated on negative potential in the counting-chamber.
Radon containing ambient air is entering the counting chamber by using the diffusion-mode through a sintermetal-air-inlet-filter with an active diameter of 180 mm, or the ERS-2-S is placed on a material, to be examinated for the determination of the Exhalation-Rate.
The other method of operation is by using the pumping mode.
Radon containing ambient air, or soil-gas is sucked by the internal air-suction pump with an airflow-rate of appr. 120 l/h through an air-inlet filter into the counting chamber.
The intelligent data collection with an alpha-spectroscopy-system, MCA with 256 channels, ADC, Pre- and Main-Amplifier is made for the collection of Po-218 for the determination of Radon and Po-216 for the determination of Thoron.

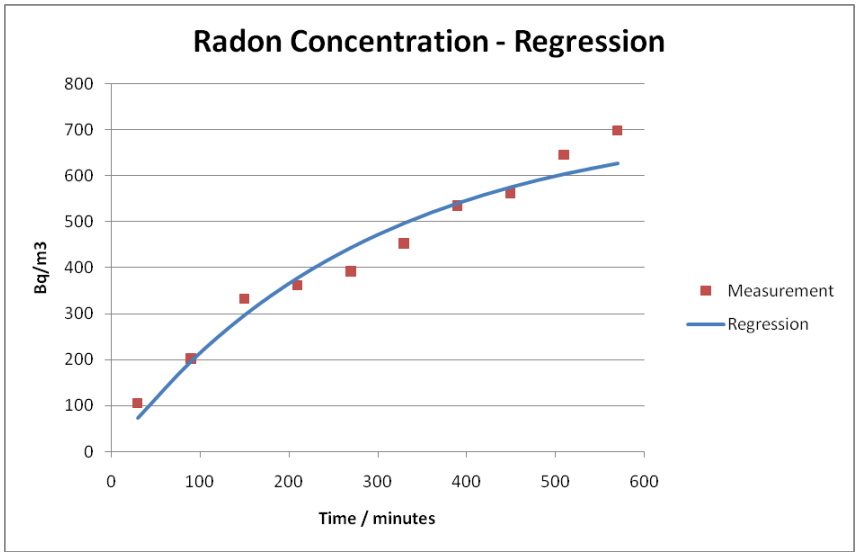
Operational dimensions and weight: 325 x 255mm, x 260 mm high, appr. 10 Kg
Electric power supply: Li-Ion-Battery, 14,4 V / 8,7 Ah, incl. charger.
Runtime without AC-line connection to the charger: > 12 h

TRACERLAB

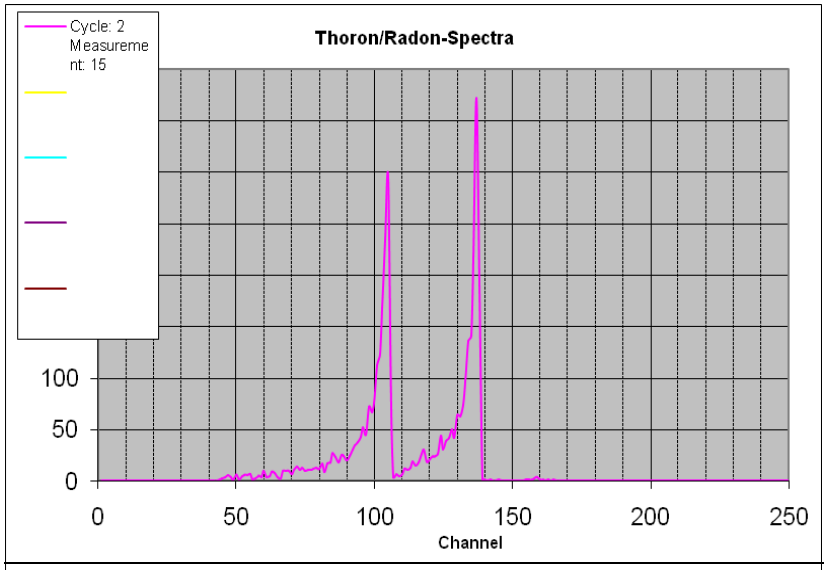
Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

ERS-2-S - Determination of the Exhalation-Rate (Flux)

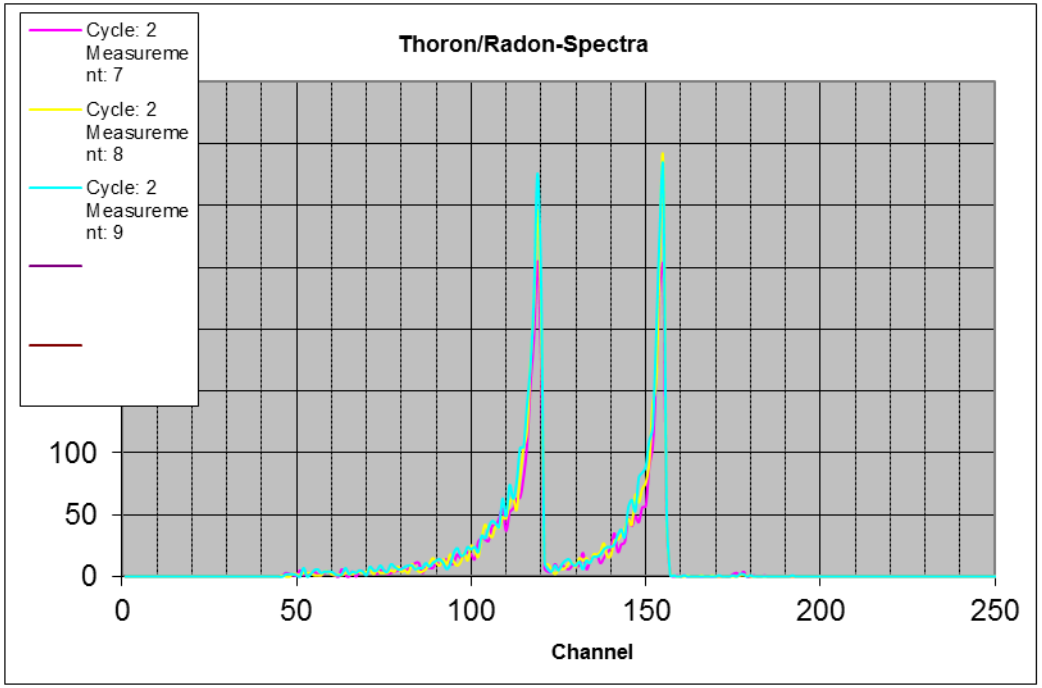
Example of a calculation-form



Example of a Radon Alpha Spectrum



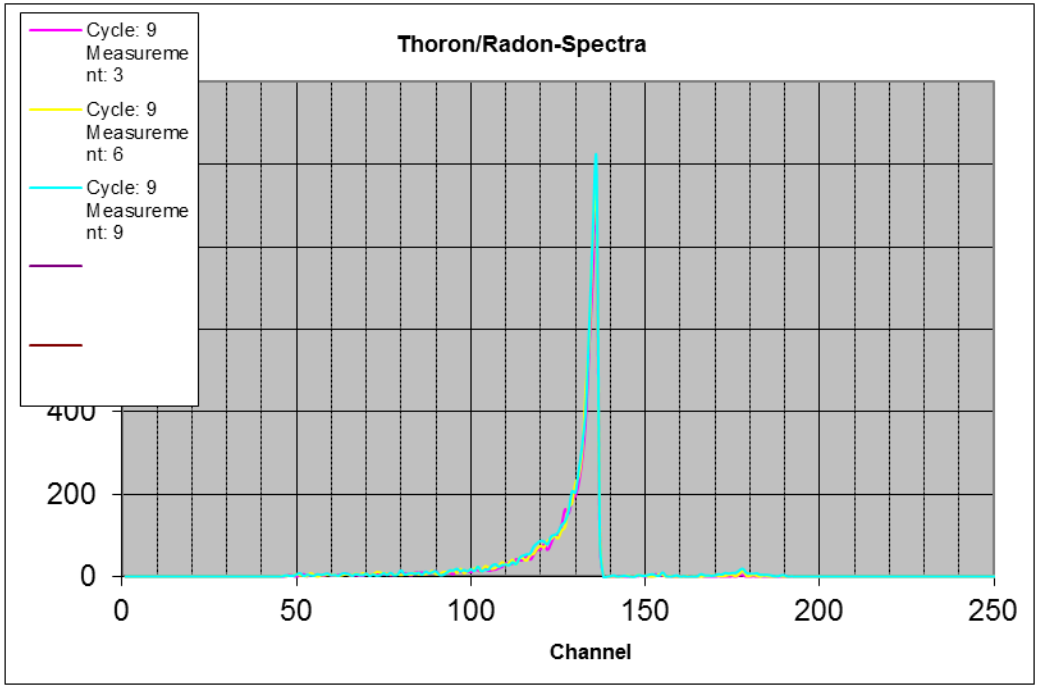
ERS – Electrostatic Radon Samplers / PC-Application Software



Po-218 Po-214

A typical collected Radon-Spectrum of an ERS – Electrostatic Radon Sampler

ERS – Electrostatic Radon Samplers / PC-Application Software



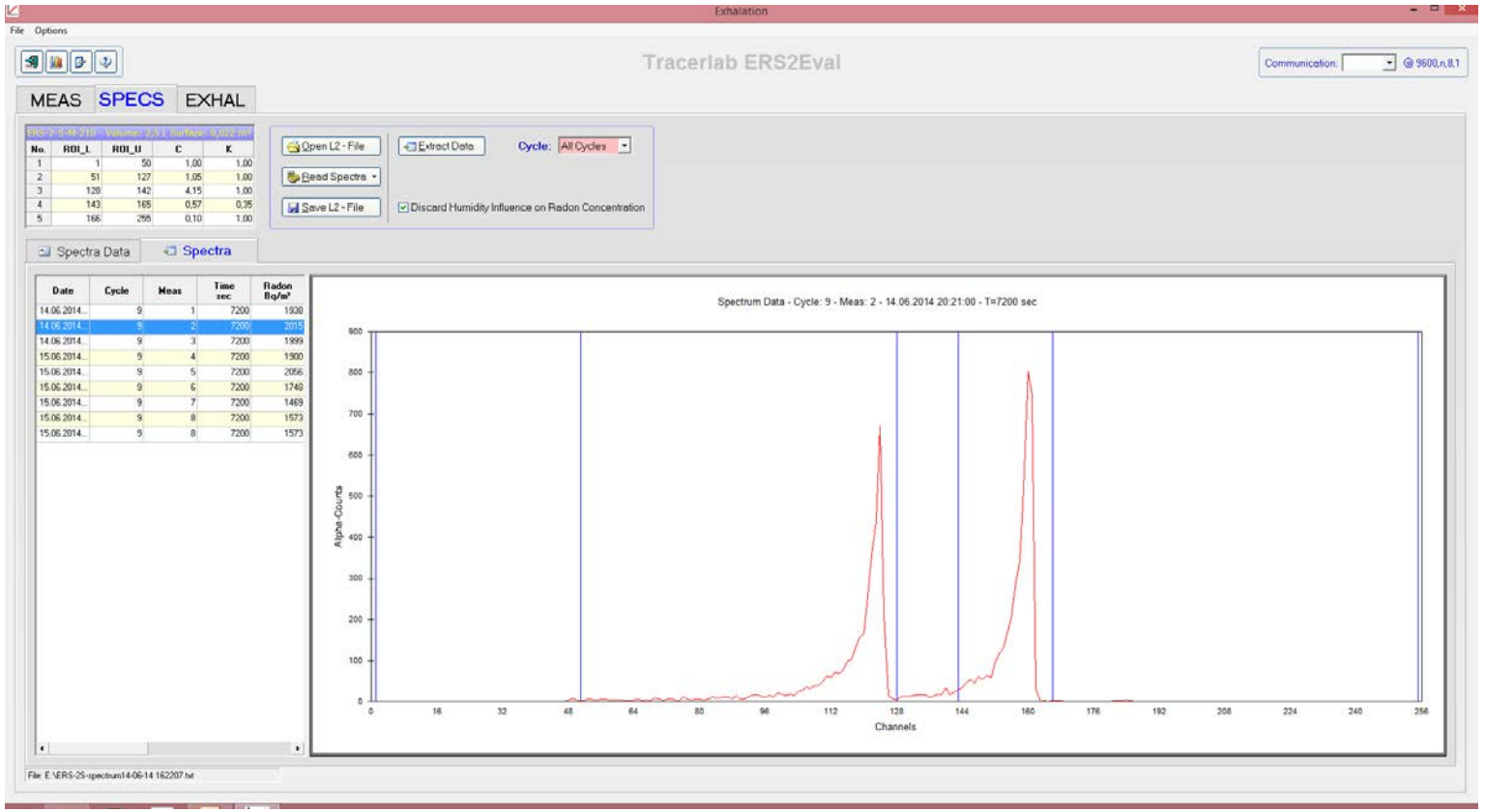
Po-216

A typical collected Thoron-Spectrum of an ERS – Electrostatic Radon Sampler

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

ERS – Electrostatic Radon Samplers / PC-Application Software ERSEval



A typical collected Thoron-Spectrum of an ERS – Electrostatic Radon Sampler by using the PC-Application Software ERSEval

TRACERLAB

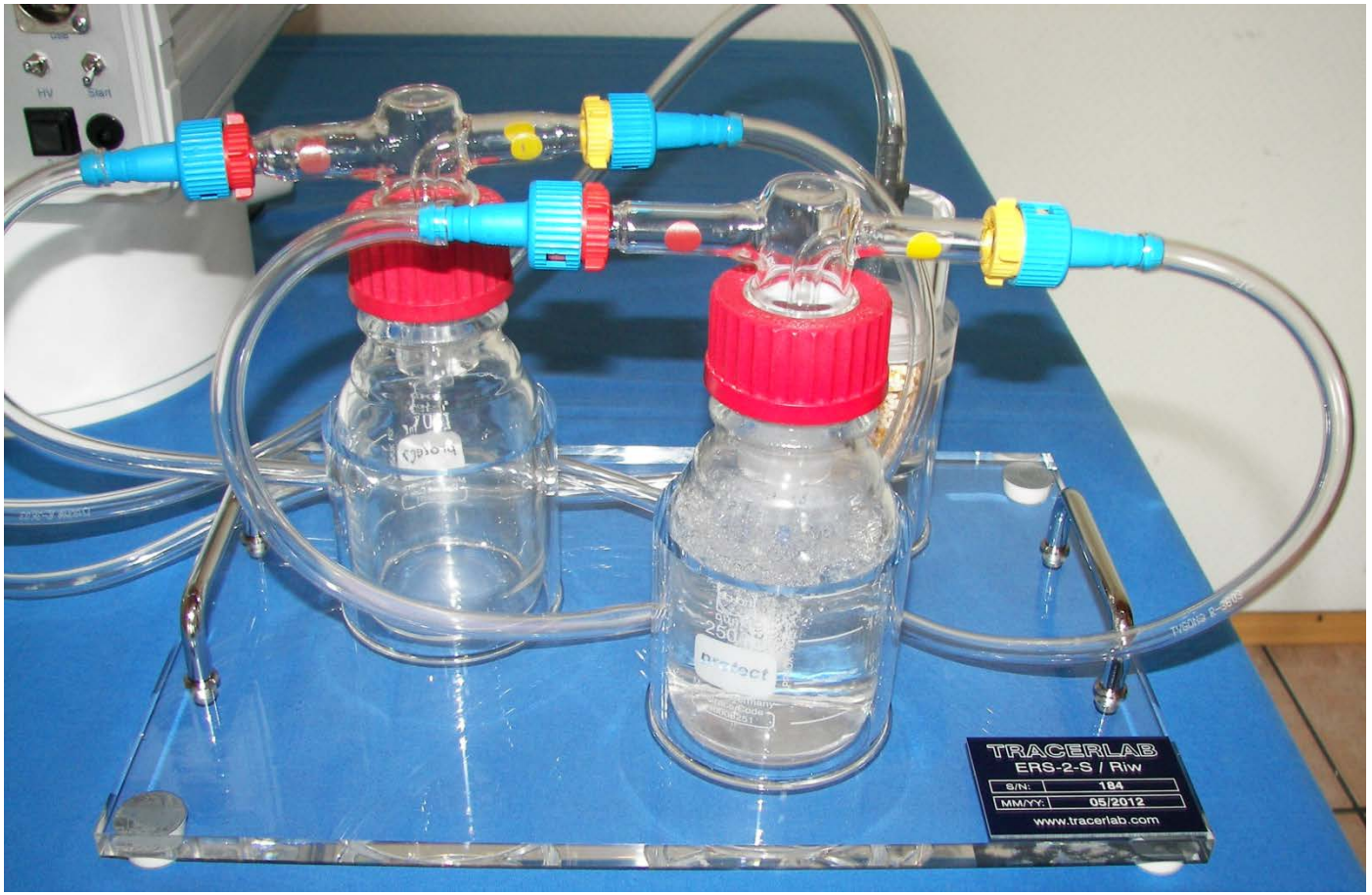
Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

TRACERLAB
ERS-2-S-RiW

An additional method
with the Hard- and Software
for the determination of
Radon in Water by using the
Radon-Monitor ERS-2-S
and the rel. application-software

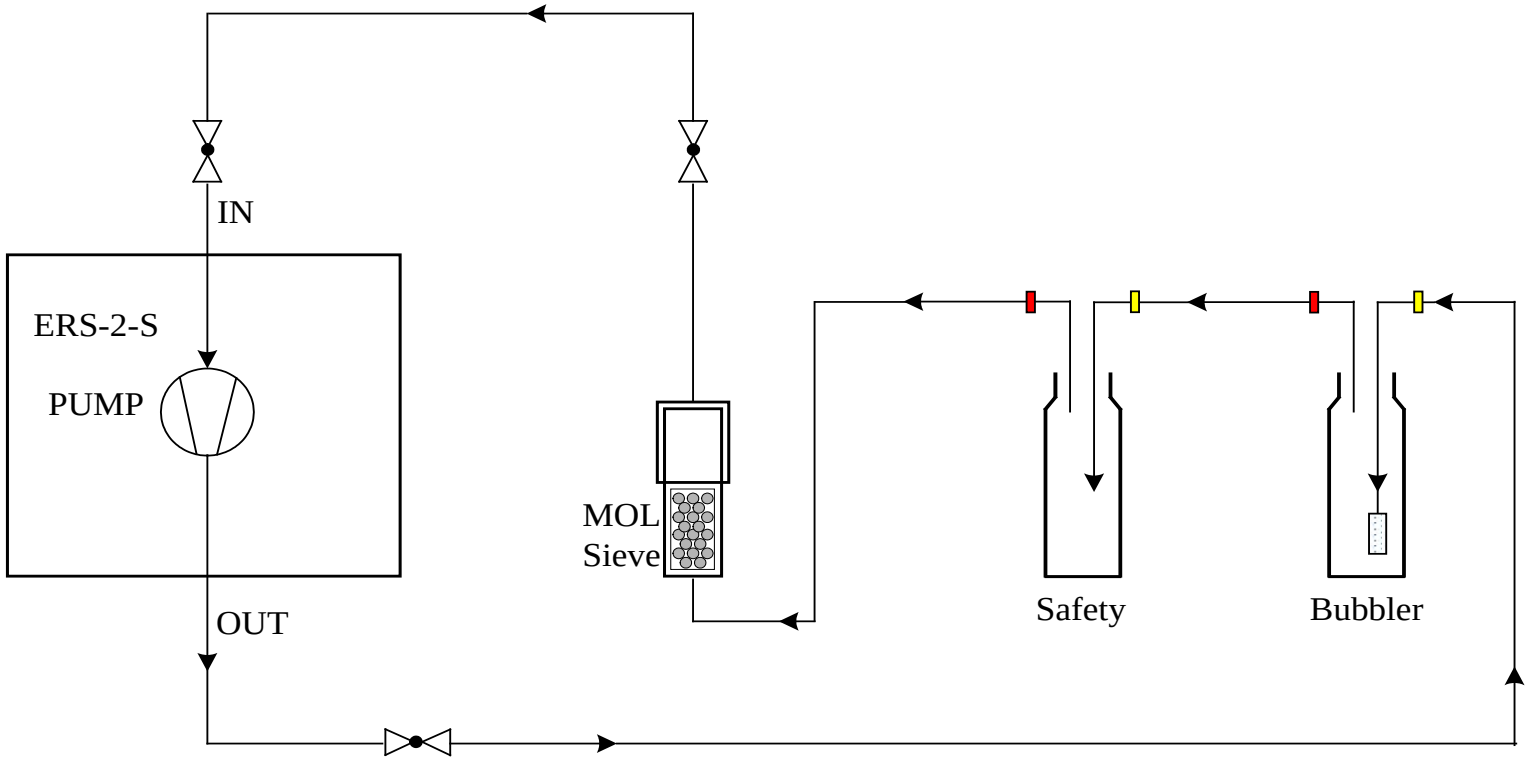
Schematic drawing ERS-2-S-RiW

The Determination of Radon in Water by using the ERS -2 - S



Schematic drawing ERS-2-S-RiW

The Determination of Radon in Water by using the ERS -2 - S



TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Lower Detection Limit for Activity Concentration Rn-222 using ERS- 2-S

Assumption:C(Rn-220) =0
C0: Background

Counting-Time	Lower Detection Limit (Bq/m3)		
min	C0=10 Bq/m3	C0=5 Bq/m3	C0=1 Bq/m3
1	588	528	476
5	158	131	108
10	94	75	59
20	58	44	33
30	44	33	24
40	36	27	19
50	32	23	16
60	28	20	14
90	22	16	10
120	18	13	8
240	12	8	5
360	10	7	4
480	8	6	3

Determination of the Exhalation-Rate:
The Lower-Limit of Detection would be appr. 0,2 mBq/m^2•s at a counting-interval of max. 3 h, Volume of 2,5 l and an Area of 0,025 m^2

Determination of Radon in Water by using the acc. RiW-Kit:
The Lower-Limit of Detection would be appr. 0,1 Bq/liter at 1 h counting-interval and a water volume of 0,5 liter.

Scintillation – Chamber - Counting – Systems and the sample preparation method with an Emanation-Stand

The Scintillation counting chamber system is made for the determination of Radon in the ambient air, or of Radium and Radon in water by using the Emanation and De-Emanation methods.
It contains major parts like scintillation counting system, scintillaltion counting chamber (lucas cells), emanation stand with the optional valumn pump, etc…
The main application of the use is in institutes who care about water treatment and control of produced water like mineral water etc…
In addition it is a very good method to be used in radon chambers and in mines.

Tracerlab scintillation chamber (Lucas-Cell) with an active ZnS coating, with a standard volume of 180 ml and an average light efficiency of appr. 60 - 65 %.
Alpha-Scint-1, using the Alpha-Scintillation-Counting-Chamber-Method:
- for the determination of Radon in air by continuously-flow-mode and grab-sampling-mode
- for the determination of Radon or Radium in water, by grab-sampling-mode and using of the transfer (emanation) -stand

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

ALPHA-SCINTILLATION-COUNTING-CHAMBER-SYSTEM

ALPHA-SCINT-1

The Alpha-Scint-1 is a self contained light-weight, portable, real-time and direct reading Radon-Monitor by using the Alpha-Scintillation-Counting-Chamber-Method (Lucas-Cell-Method)

Mode and Methods of Operation:

- Grab-Sampling Method for the determination of Radon in the Air
- Continuously-Flow-Sampling Method for the determination of Radon in the Air
- Grab-Sampling Method for the determination of Radon in Water

by using the transfer (Emanation) method-stand to transfer the Radon-Gas from a sample-container (bottle) into the evacuated Scintillation-(Lucas) Cell

Operational dimensions and weight: 325 x 255 mm, x 135 mm high, 7,5 Kg

Electric power supply: Li-Ion-Battery, 14,4 V / 8,7 Ah, incl. charger.

Runtime without AC-line connection to the charger: > 12 h

Scintillation – Counting – Chamber – Lucas-Cells

Vacuum leakproof scintillation chamber with an active ZnS coating, standard Tracerlab volume 180 ml, average light efficiency 60 - 65 %

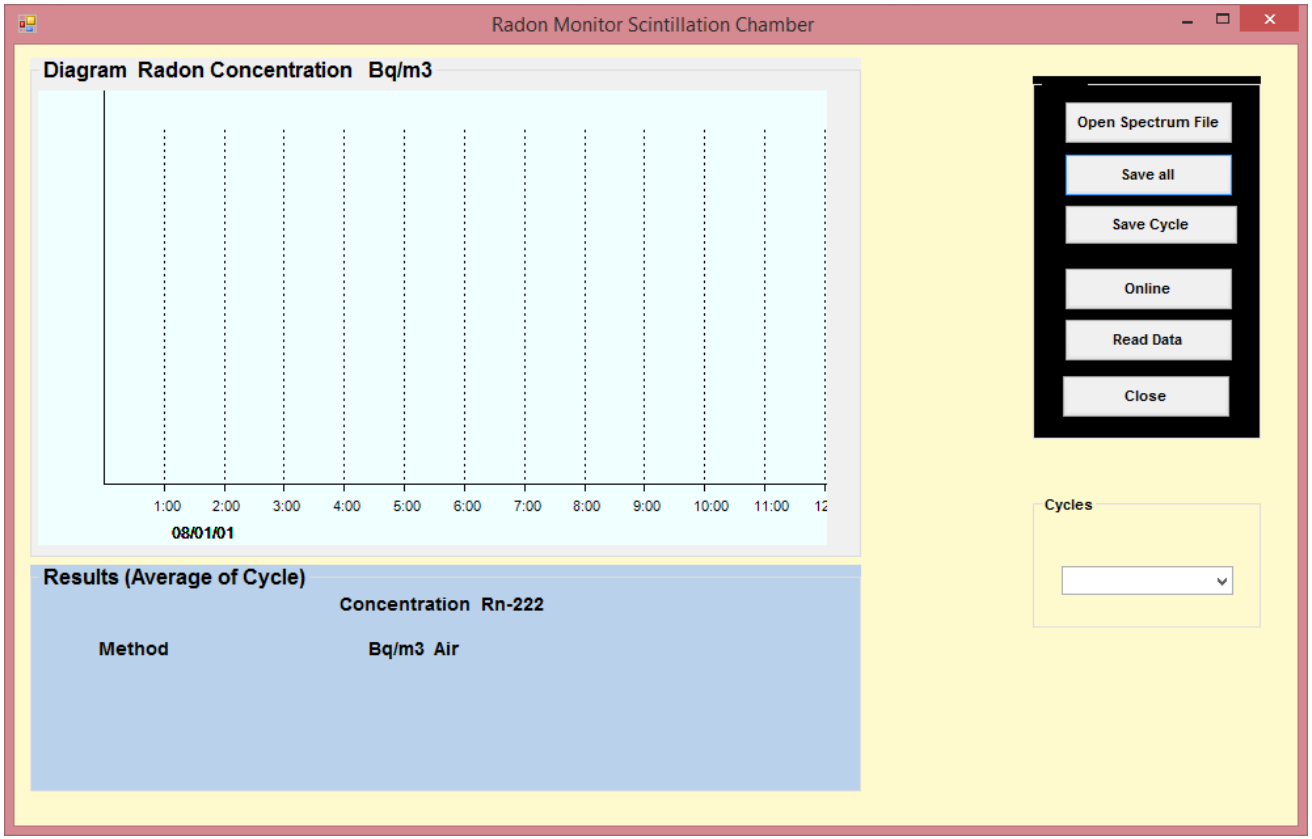
Limits of Detection, comparing of different Methods

Method		Vol. l	Detection Limit	
Ra-226 in Water	Direct Measurement	0,02	**0,14**	**Bq/l**
	Enrichment	1,00	**0,003**	**Bq/l**
Radon in Water	Sample in Emanation Vial	0,02	**0,13**	**Bq/l**
	Sample in Bottle	0,15	**0,02**	**Bq/l**
Radon in Air	No Flow-through (static)	0,18	**14,5**	**Bq/m³**
	Flow-through	0,18	**13,8**	**Bq/m³**

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Alpha-Scintillation-Counting-System / PC-Application Software

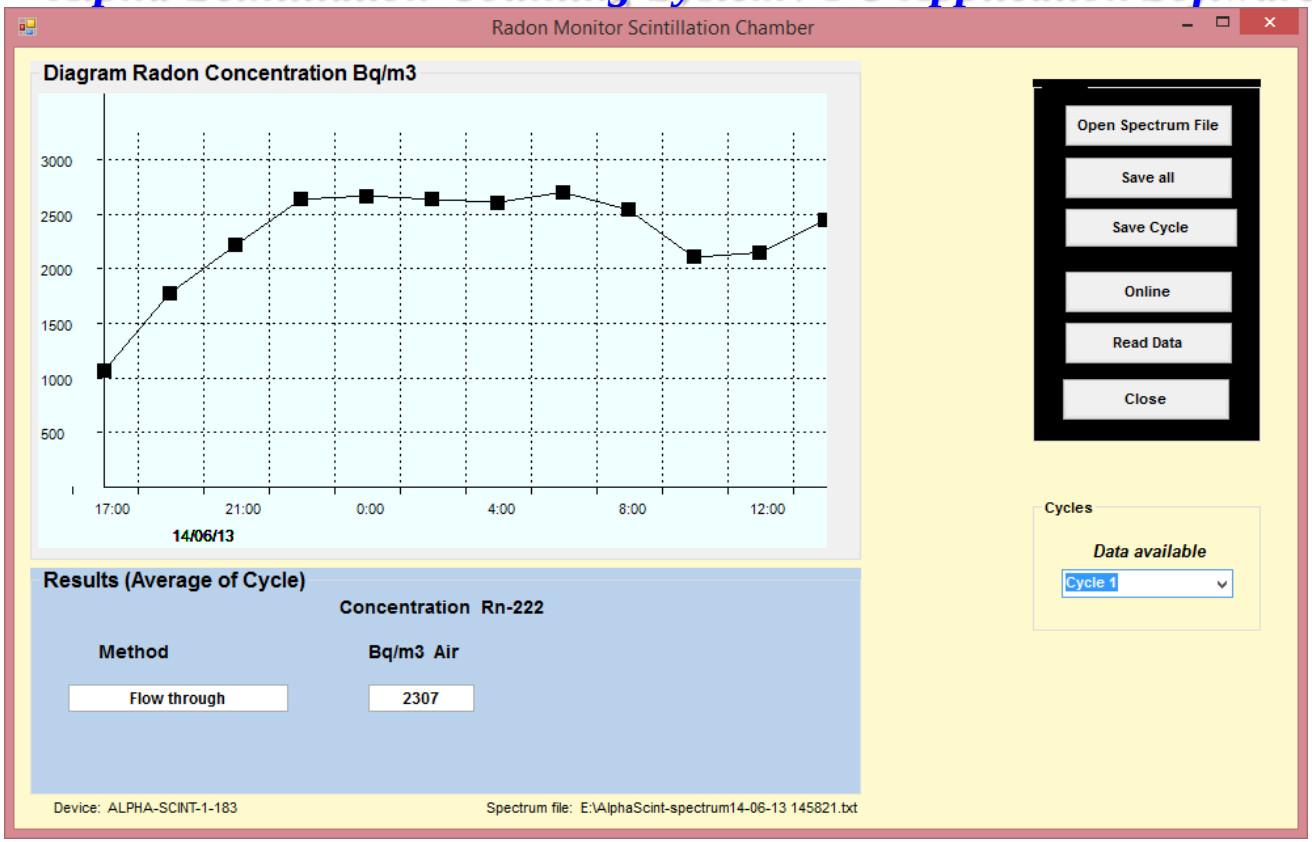


The PC-Application-Software can be used on an external PC under Windows XP, Windows 7 and Windows 8.
An Alpha-Scint-1 can be connected for a direct online-operation.
For the evaluation of measurement-data by using the PC-Application-Software, the Alpha-Scint-1 can be connected for an online / direct-reading of collected data from the systems memory, or already collected data can be read-in for the data-processing.

TRACERLAB

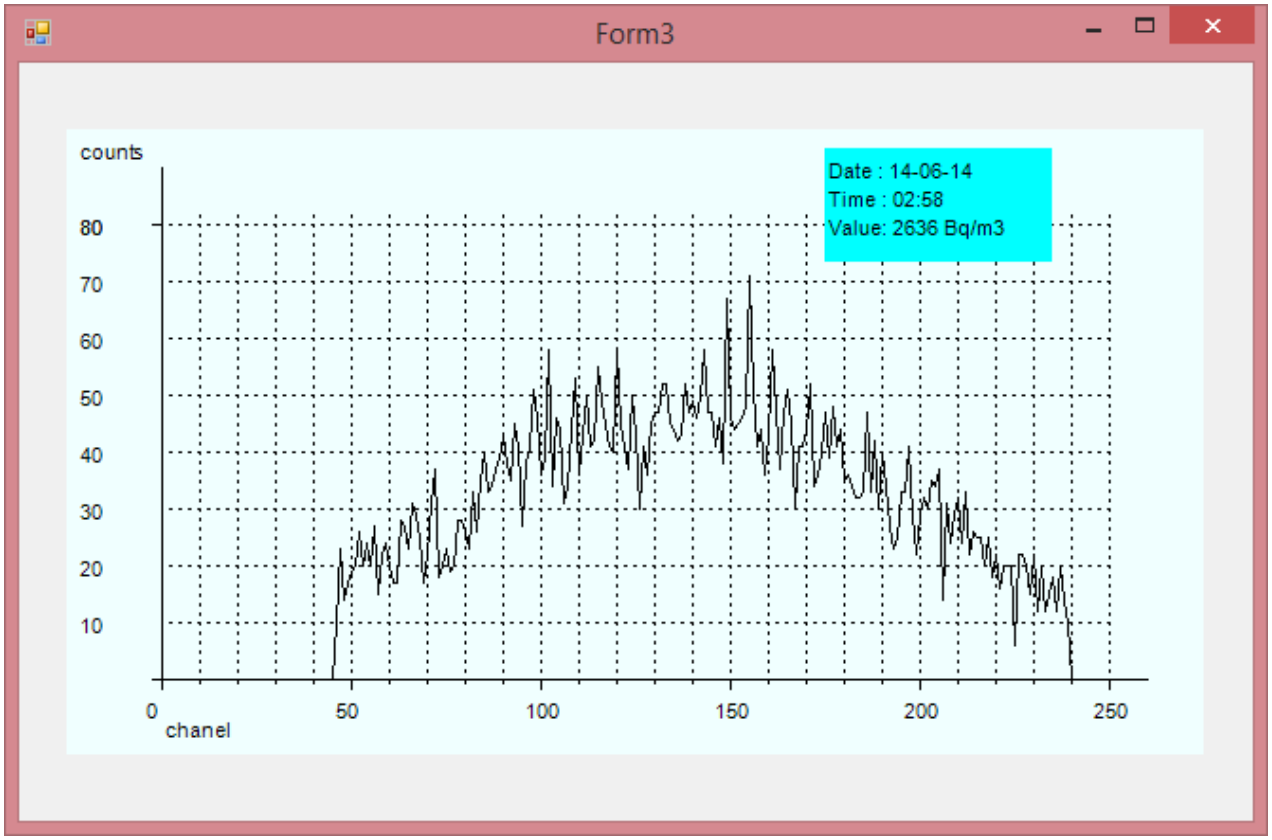
Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Alpha-Scintillation-Counting-System / PC-Application Software



The PC-Application-Software for the Alpha-Scint-1 is made to read-in the collected data from measurements, for the evaluation of data-processing

Alpha-Scintillation-Counting-System / PC-Application Software



A typical collected Alpha-Scintillation-Chamber Spectrum of the Alpha-Scint-1

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Sample-Preparation, complete emanation stand with glass apparatus, vacuum pump, scintillation-chamber and an active cleaning process

Emanation-Stand for the transfer of the Radon-Gas into the evacuated Scintillation-Chamber

Emanation-Stand with the ACTIVE and timer-controlled cleaning PROCESS

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Complete emanation stand with glass apparatus, vacuum pump, scintillation counter, Lucas-chamber and active cleaning process

The Radon-Transfer stand with a digital Vacuummeter

Automatic cleaning process of used scintillation chambers with a timer-controlled program

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

TRACERLAB offers compact totally-integrated systems
for the Determination of the Radon/Thoron-Daughter-Concentration in the air,
made as self contained instruments with all elements of an intelligent data collection
with an alpha-spectroscopy-system

$$\text{Rn-222} \xrightarrow[3.8\ \text{d}]{\alpha} \text{Po-218} \xrightarrow[3\text{m}]{\alpha} \text{Pb-214} \xrightarrow[27\text{m}]{\beta} \text{Bi-214} \xrightarrow[20\text{m}]{\beta} \text{Po-214} \xrightarrow[<1\,\text{sec}]{\alpha} \text{Pb-210}$$

Radon- and Thoron-Daughter-Working-Level-Monitor

- BWLM-PLUS-S - Standard single-channel Radon-Daughter-Working-Level-Monitor
- RDM-S/CV – compact version of a single-channel Radon-Daughter-Working-Level-Monitor

- BWLM-PLUS-2S - dual-channel Radon-Daughter-Working-Level-Monitor for the determination of the attached and unattached fraction of the progeny-concentration

- RDM-PLUS-SF - single-channel Radon-Daughter-Working-Level-Monitor, made as an automatic step-filter-system

- ERS/RDM-2S - dual channel, Radon/Thoron- and Progeny-Monitor
- ERS/RDM-2S/CV – compact version of a dual-channel Radon/Thoron- and Progeny Monitor

The determination of the Radon/Thoron-Daughter concentration

Introduction of the method:

The most important components of the natural radioactivity are the daughters of Radon-222. The Radon Daughter Working Level Monitor measures the potential alpha energy concentration of Radon-222 decay products in the air .

Additionally it analyzes the concentrations of the different daughter nuclides. These radioactive nuclides are inhaled and deposited in the respiratory tract.

The Radon/Thoron-Daughter-Monitors are operating in the same way.

The air-suction pump sucks the airborne Radon-Daughters and deposites them on a filter. The collected radioactive material irradiates the detector instead of the lung tissue.

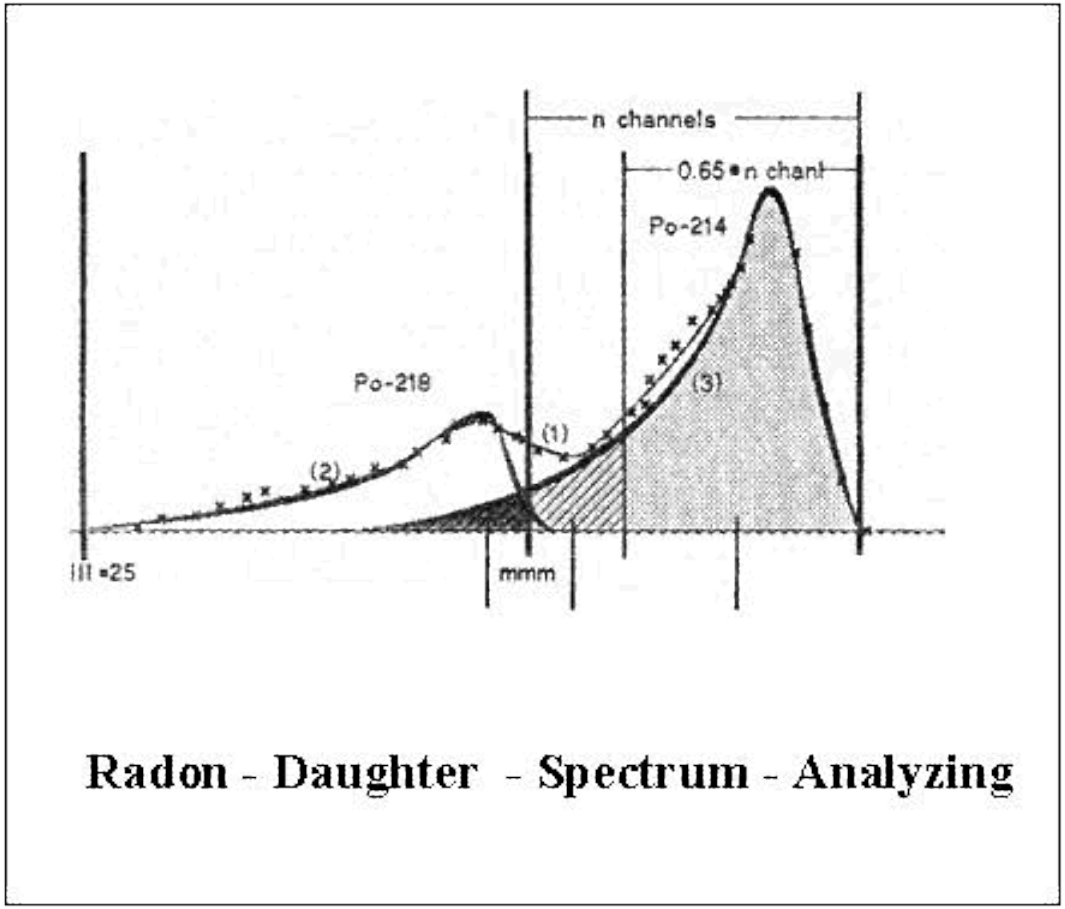
That is, the Standard Radon-Daughter-Working-Level-Monitors are not measuring the radon gas, but the much more dangerous Radon-Daughter-Concentration, which is collected on a filter.

The risk attendant upon exposure to radon gas and the much more dangerous Radon Daughters in residential and commercial buildings, working-areas at special places like mines, caves etc. have received considerable recent discussion in the press and much public and governmental attention. Exposure of radon gas and the decay products , the radon daughters are an organic problem which must be identified and addressed .

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

The Determination of the Radon-Daughter-Concentration
by using the TRACERLAB Radon-Daughter-Monitors
Description about the methods…



The Determination of the Radon-Daughter-Concentration by using the TRACERLAB Radon-Daughter-Monitors Description about the methods…

Short Discription of measuring methods for Radon Decay products with the devices RDM, RDM-SF, BWLM, and (ERS) / RDM

The Tracerlab device for measurements of radon decay products is usable to measure potential alpha energy concentration (Cp) as well as activity concentration of single nuclides (Ci; Po-218, Pb-214, Bi/Po-214). Measurements are founded in sampling of decay products on filters using air flow through the filters driven by a pump and measurement of alpha radiation of sampled nuclides.

Three kinds of methods for different uses are implemented in Tracerlab device. The choice of the method can be carried out on the display of the device. Fundamentally all data are saved in ASCII-files. These are the measured spectra as well as the calculated concentrations. Structure of concentration files depends on used methods.

The Determination of the Radon-Daughter-Concentration by using the TRACERLAB Radon-Daughter-Monitors Description about the methods…

1. Short time measurement

Short time measurement is used for radiation protection measurements in working areas especially like mines and caves. The advantage is the short time of about 15 minutes for a result of measurement for a quick characterisation of the situation at working places. For this, a number of methods were developed in the past, cited in literature. The principle of measurement is based on short sampling of radon decay products (typical 5 minutes) and counting alpha decays on filter in time intervals specific for the different methods after sampling or while sampling. With this method by using the measured counts and by a special algorithm the potential alpha energy concentration or concentration of nuclides can be calculated. In the Tracerlab device the method of Markov (/1/) will be used. This method has a good performance for use in mines. Result is available after 15 minutes and systematic errors are smaller than 20 %

How does it works, the time-schedule of a measurement:

sampling: 5 minutes
break: 1 minute
counting: 3 minutes (N1)
break: 3 minutes
counting: 3 minutes (N2)

Using the values N1 and N2 the potential alpha energy concentration and nuclide concentrations will be calculated. For each measurement a new filter (without activity) must be used.

The Determination of the Radon-Daughter-Concentration by using the TRACERLAB Radon-Daughter-Monitors Description about the methods…

2. Continuously Measurement

This method is used when the time dependence of the potential alpha energy concentration or equilibrium factor (between Radon and decay products) is needed, especially for radiation protection measurements on working places for better assessment of the situation.
Herby air is pumped continuously through a filter. The count rate n(t) of alpha radiation is measured to calculate the potential alpha energy concentration. In practice, the measurement is carried out by counting pulse sum N in a time interval T_{int}.

2.1 slow measurements

Herby the potential alpha energy concentration (Cp) is calculated using the simple equation

$$Cp = k \cdot n = k \cdot \frac{N}{T_{int}}$$

with k= calibration factor.
The advantage of this method is a small statistical uncertainty at small concentrations. The disadvantage is the large time constant of measured values for changes in concentrations. Time constant is about 2 hours for 80 %.

2.2 fast measurements

To see quick changes in potential alpha energy concentration it is possible to use a special algorithm. Therefore 2 measurements of count sums N will be used for calculation. The disadvantage of this method is a higher statistical uncertainty compared with slow method (about factor 10).

The Determination of the Radon-Daughter-Concentration by using the TRACERLAB Radon-Daughter-Monitors Description about the methods…

3. Quasi continuously measurements

This method can be used to estimate the concentration of single nuclides without systematic errors. This is necessary in the case of scientific investigations for instance to estimate time constants of physical processes like wall deposition of decay products or ventilation in rooms.
Hereby a cycle of sampling and decay is realised. The decrease function of filter activity in decay time span is used to calculate concentrations of the nuclides in air with a higher precision than in short time measurement. A change of filter is not required.
The calculation of nuclide concentration is based on the method of least squares for an over estimated system of equations.
In the Tracerlab device a sampling time of 20 minutes and a decay time of 40 minutes is used.
This time spans are chosen to optimize between small statistical uncertainty and good time resolution.
In practice, no better time resolution is necessary. At very small concentrations in the air, the user can calculate adapted mean values of single measurements.

Reference:

/1/ Markov, K.R.; Ryabov, N.V.; Stas, K.N.
Ehkspress-metod otsenki radiatsionnoj opasnosti, swyazannoj s nalichiem w wozdukhe dochernkh productov radona.
At. Ehnerg. 12 (1962) 315

The Determination of the Radon-Daughter-Concentration by using the TRACERLAB Radon-Daughter-Monitors Description about the methods…

Table of calculation for the lower limit of detection of the Radon/ThoronProgenyMonitors

The operation of the instrument by using a different sampling volume and / or a different sampling time is given a different lower limit of detection.

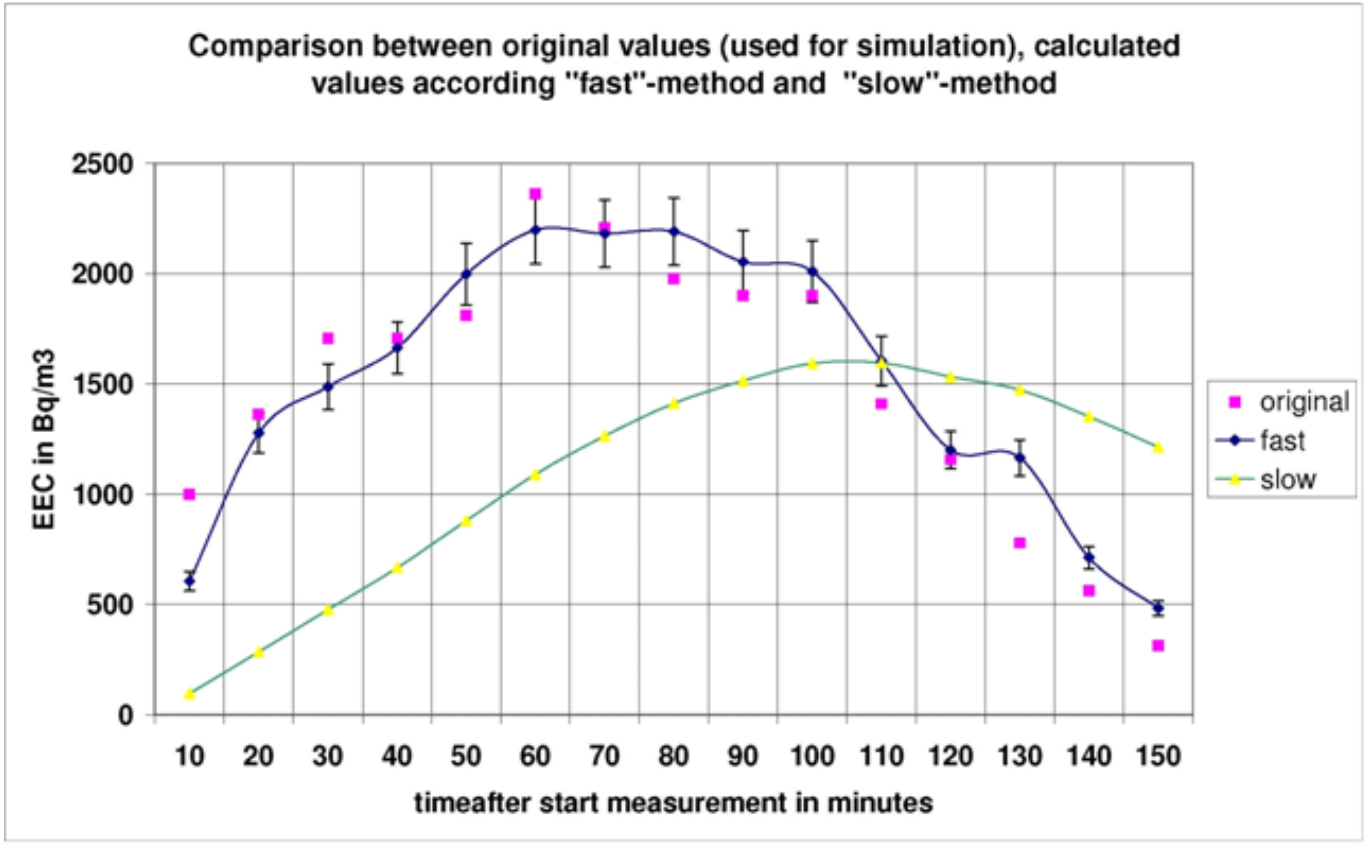
DetectorEfficiency = 0.2 (20%)

Method	Air- Flow Rate l/h	MeasuringTime min	EECLLD Bq/m3
Markov	100	3	12
Markov	800	3	2
Continuousslow	100	10	0.3
Continuousslow	100	60	0.1
Continuousslow	800	10	0.03
Continuous slow	800	60	0.01
Continuous fast	100	10	20
Continuous fast	100	60	5
Continuous fast	800	10	3
Continuous fast	800	60	0.8

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

The Determination of the Radon-Daughter-Concentration by using the TRACERLAB Radon-Daughter-Monitors Description about the methods…



TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

BWLM-PLUS-S S – RDM-S/CV
Single Channel Radon/Thoron Daughter Working Level Monitors

The BWLM-PLUS-S as the standard version with a removable sampler, or the RDM-S/CV as a compact version with a fixed sampler, are active, real time and direct reading Radon/Thoron-Progeny-Monitors.

Methods of Operation:

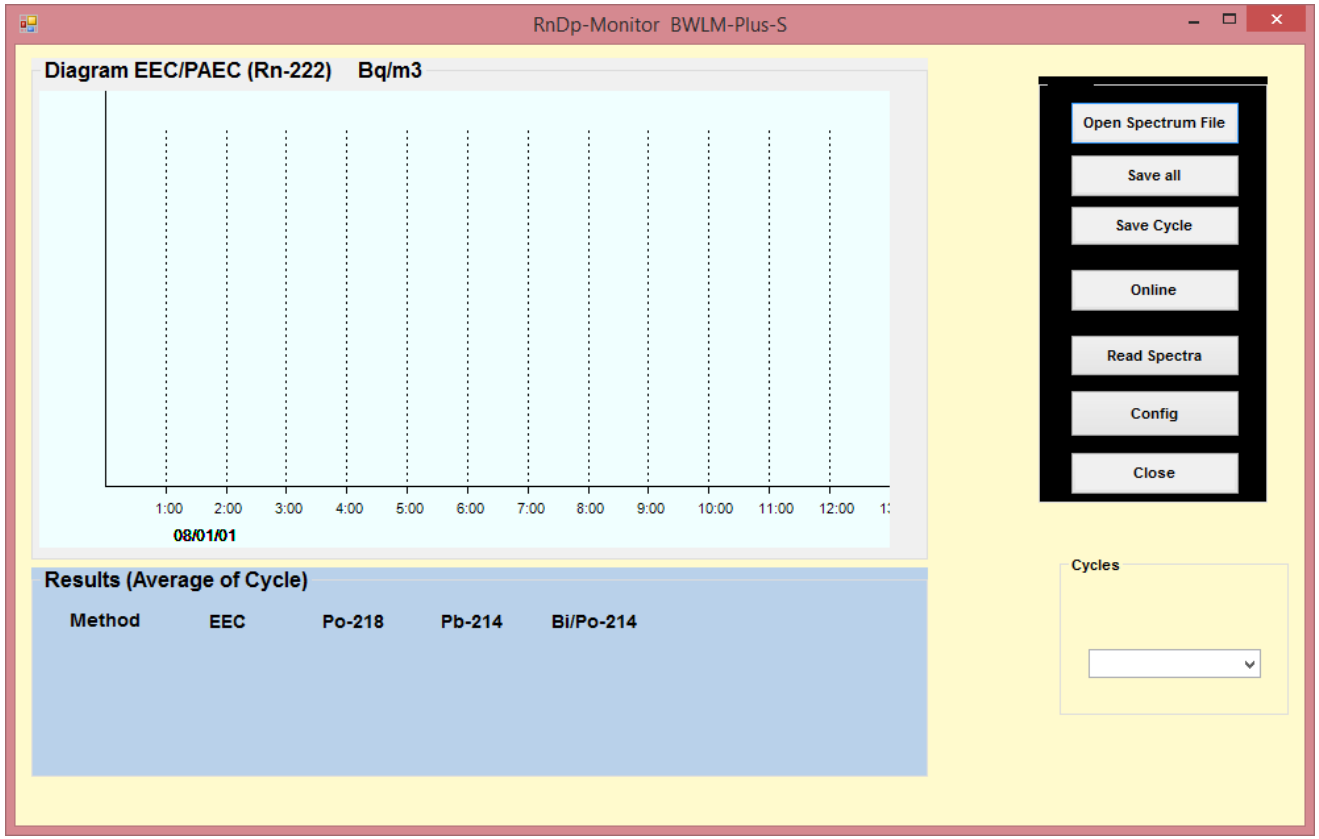
- **Markov-Method to get results after 15 Minutes**
- **Continuous-Method to select independent counting-intervals in fixed steps on the users own decision**
- **Nuclide-Specific-Calculation Method in fixed intervals of one hour, for the determination of single nuclides of the Radon/Thoron-Daughter-Concentration**

Operational dimensions and weight BWLM-PLUS-S: 325 x 255 x 155 mm, 7,5 Kg
Operational dimensions and weight RDM-S/CV: 255 x 105 mm, x 240 mm, 3,5 Kg
Electric power supply: Li-Ion-Battery, 14,4 V / 8,7 Ah, incl. charger.
Runtime without AC-line connection to the charger: > 12 h

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Single-Channel Radon/Thoron-Progeny-Monitors / PC-Application Software

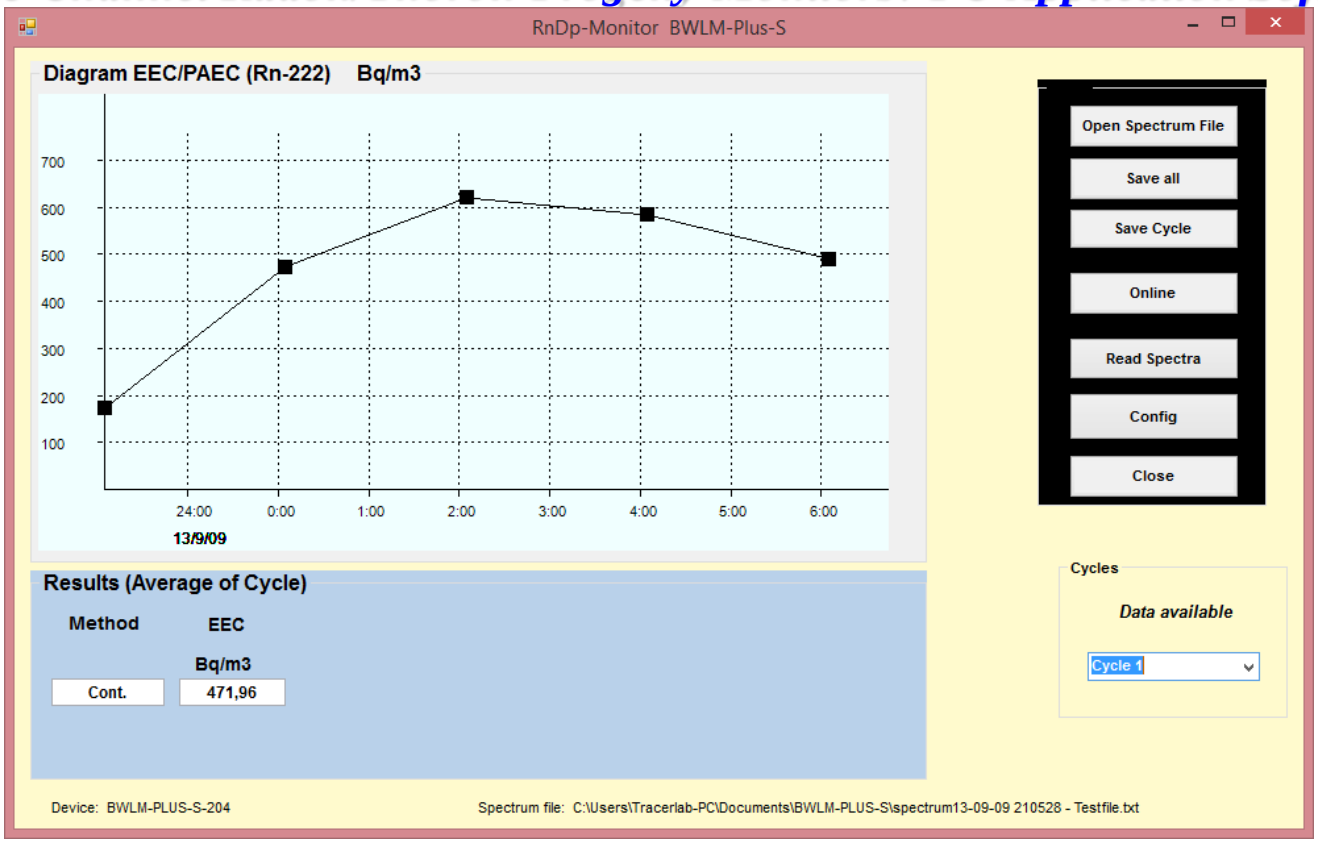


The PC-Application-Software can be used on an external PC under Windows XP, Windows 7 and Windows 8.
A BWLM-PLUS-S or RDM-S/CV can be connected for a direct online-operation.
For the evaluation of measurement-data by using the PC-Application-Software, the BWLM-PLUS-S or the RDM-S/CV can be connected for an online / direct-reading of collected data from the systems memory, or already collected data can be read-in for the data-processing.

TRACERLAB

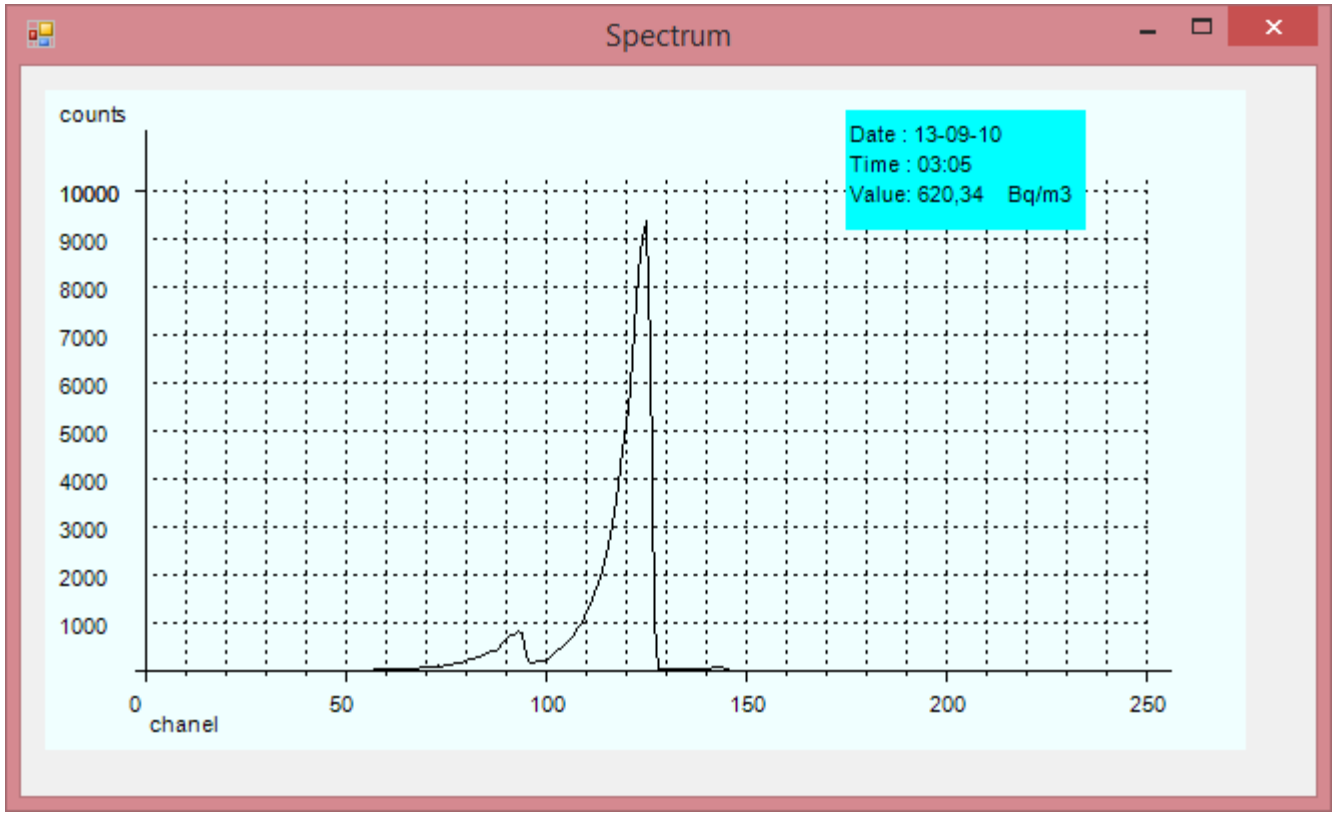
Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Single-Channel Radon/Thoron-Progeny-Monitors / PC-Application Software



The PC-Application-Software for the BWLM-PLUS-S or RDM-S/CV is made to read-in the collected data from measurements, for the evaluation of data-processing

Single-Channel Radon/Thoron-Progeny-Monitors / PC-Application Software

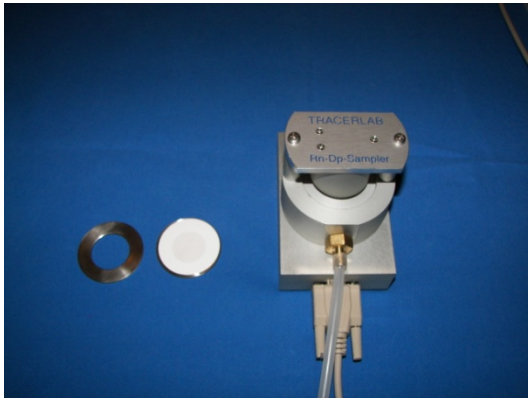


A typical collected Radon-Progeny-Spectrum of the ERS/RDM-2S or ERS/RDM-2S/CV

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

The independent and removable sampler with the filter holding device



The Radon/Thoron-Daughter Working Level Monitors are with an independent and removable Sampler, which is made for an easy placing of a membrane-filter for the collection of the Radon/Thoron-Daughter-Concentration.
The membrane-filter will be fixed in between a double stainless-steel filter holding-device , before placing the holding-device under the detector.

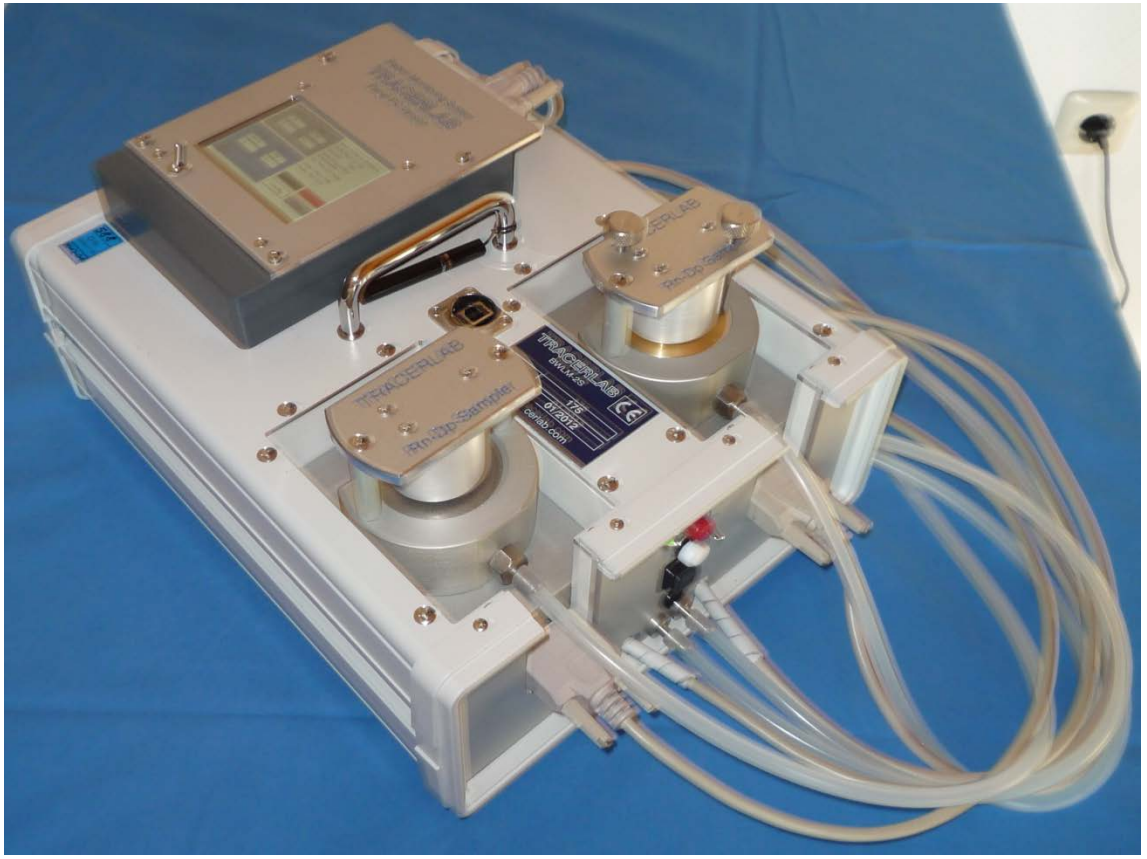
TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

BWLM-PLUS-2S - Dual Channel Radon/Thoron Daughter Working Level Monitor

The BWLM-PLUS-2S is an active, real time and direct reading dual-channel Radon/Thoron-Progeny-Monitor, with two each independent samplers.
One sampler is with the membrane-filter for the determination of the attached fraction and one sampler is with a mesh, for the determination of the unattached fraction of the Radon/Thoron-Daughter-Concentration.

Methods of Operation:
- **Markov-Method to get result after 15 Minutes**
- **Continuous-Method to select independent counting-intervals in fixed steps on the users own decision**
- **Nuclide-Specific-Calculation Method in fixed intervals of one hour, for the determination of single nuclides of the Radon/Thoron-Daughter-Concentration**

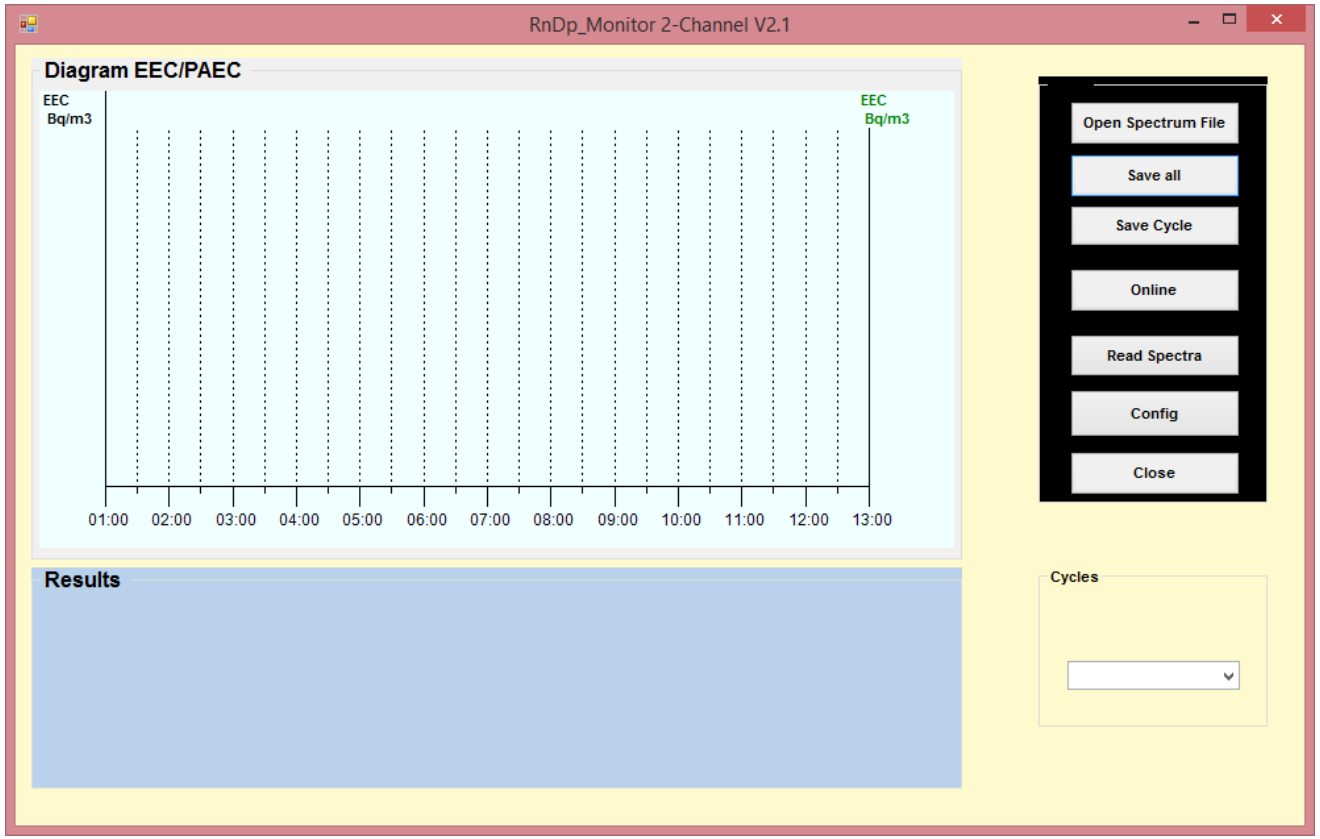


Operational dimensions and weight:
325 x 255 mm, x 155 mm high, 9,0 Kg
Electric power supply: Li-Ion-Battery, 14,4 V / 8,7 Ah, incl. charger.
Runtime without AC-line connection to the charger: > 10 h

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Dual-Channel Radon/Thoron-Progeny-Monitor / PC-Application Software

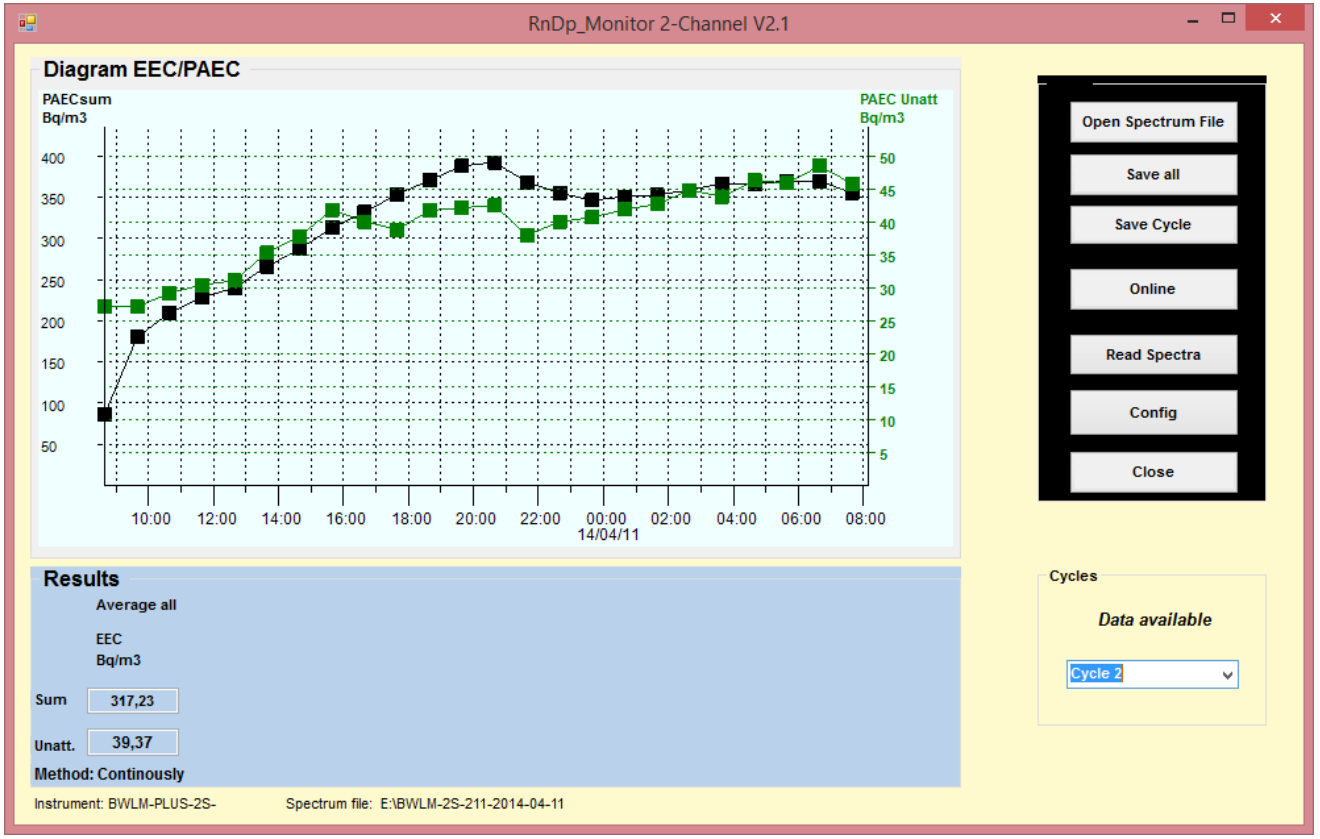


The PC-Application-Software can be used on an external PC under Windows XP, Windows 7 and Windows 8.
A BWLM-PLUS-2S can be connected for a direct online-operation.
For the evaluation of measurement-data by using the PC-Application-Software, the BWLM-PLUS-2S can be connected for an online / direct-reading of collected data from the systems memory, or already collected data can be read-in for the data-processing.

TRACERLAB

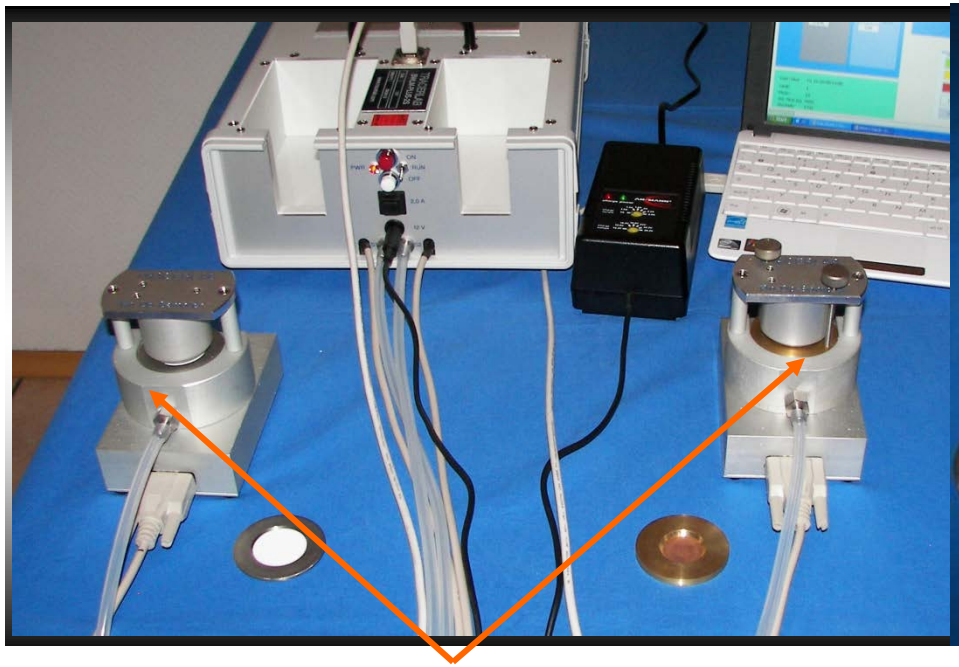
Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Dual-Channel Radon/Thoron-Progeny-Monitor / PC-Application Software

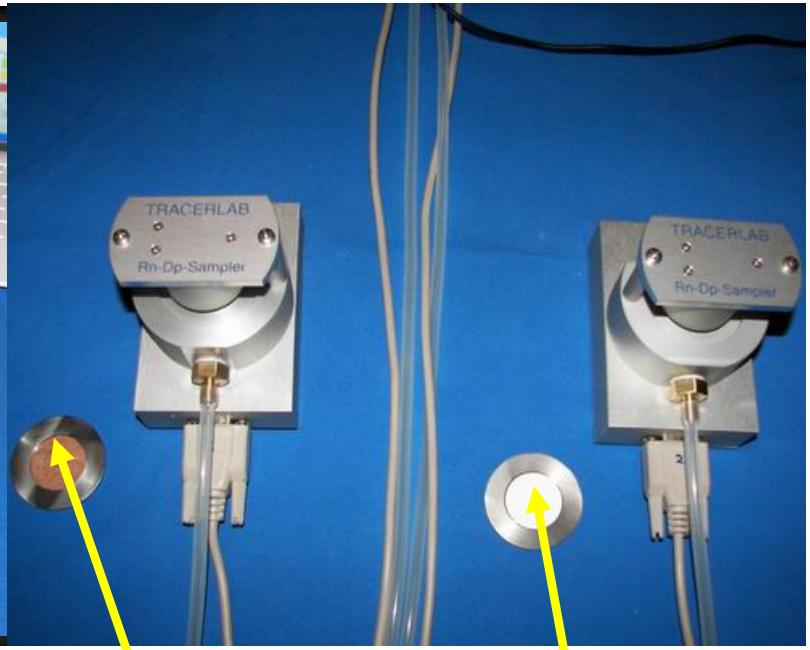


The PC-Application-Software for the BWLM-PLUS-2S is made to read-in the collected data from measurements, for the evaluation of data-processing

Radon / Thoron – Daughter-Working-Level-Monitor
Dual-Channel version BWLM-PLUS-2S
for the determination of the attached and unattached fraction



Removable samplers



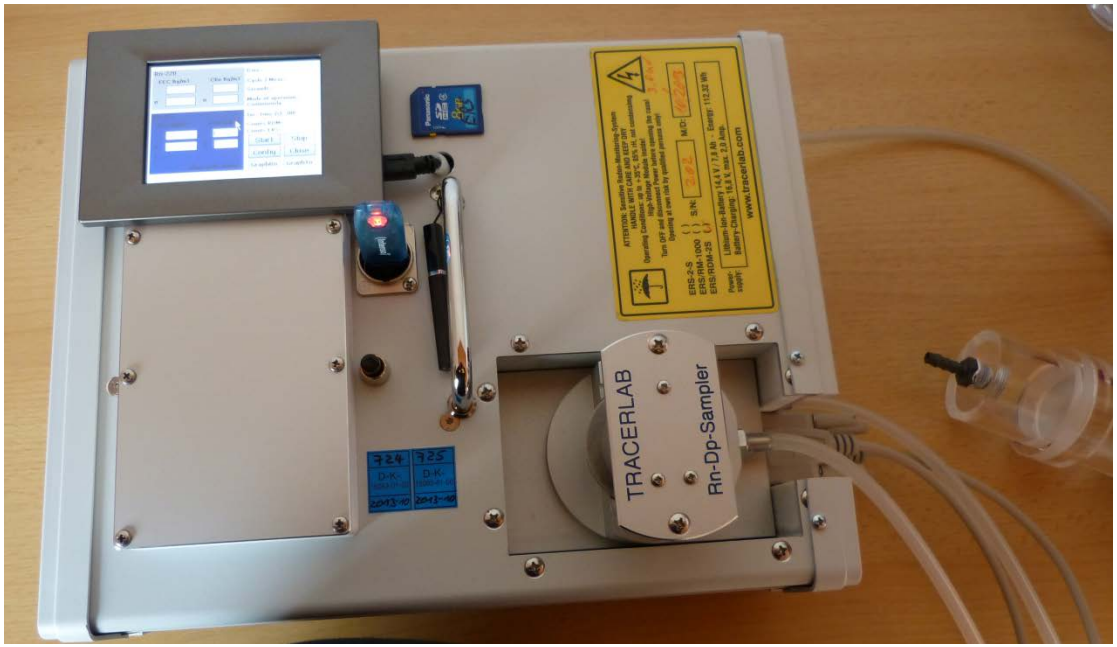
with a mesh **with a membrane-filter**

Dual-Channel-Version ERS/RDM-2S
an advanced Radon/Thoron- and Radon/Thoron-Progeny-Monitor

ERS/RDM-2S:

The ERS/RDM-2S is an advanced, active, real time and direct reading Radon/Thoron- and Progeny-Monitor.

The display of the Panel-TPC shows the actual calculated results for Rn-222, Rn-220 and the Equilibrium Factor „F“



Dual-Channel-Version of an advanced Radon/Thoron- and Radon/Thoron-Progeny-Monitor

ERS/RDM-2S:

The ERS/RDM-2S is an advanced, active, real time and direct reading Radon/Thoron- and Progeny-Monitor.
The ERS/RDM-2S is designed for the Determination of the Radon/Thoron-Gas-Concentration by using the diffusion-mode, or by using the pumping-mode.

In addition, the ERS/RDM-2S is designed for the Determination of the Radon/Thoron-Daughter-Concentration.

ERS/RDM-2S - Mode and Methods of Operation, Facts and Definitions

The ERS/RDM-2S is an advanced, active and direct reading Dual-Channel Radon/Thoron- and Radon/Thoron-Progeny-Monitor. The operation of the ERS/RDM-2S is by using the integrated Panel-TPC.

For the determination of the Radon/Thoron-Concentration, it is working as an Electrostatic-Radon-Sampler with a metallic hemisphere / counting-chamber of 250 ml volume and a positive High-Voltage of 3 kV connected to the metallic hemisphere. An Alpha-Sensitive Detector (Canberra PIPS-Detector) is built-in isolated on negative potential in the counting-chamber. Radon containing ambient air is entering the counting chamber by using the diffusion-mode through a sintermetal-air-inlet-filter with an active diameter of 70 mm.
The other method of operation is by using the pumping mode. Radon containing ambient air, or soil-gas is sucked by the internal air-suction pump with an airflow-rate of appr. 120 l/h through an air-inlet filter into the counting chamber.
The intelligent data collection with an alpha-spectroscopy-system, MCA with 256 channels, ADC, Pre- and Main-Amplifier is made for the collection of Po-218 for the determination of Radon and Po-216 for the determination of Thoron.

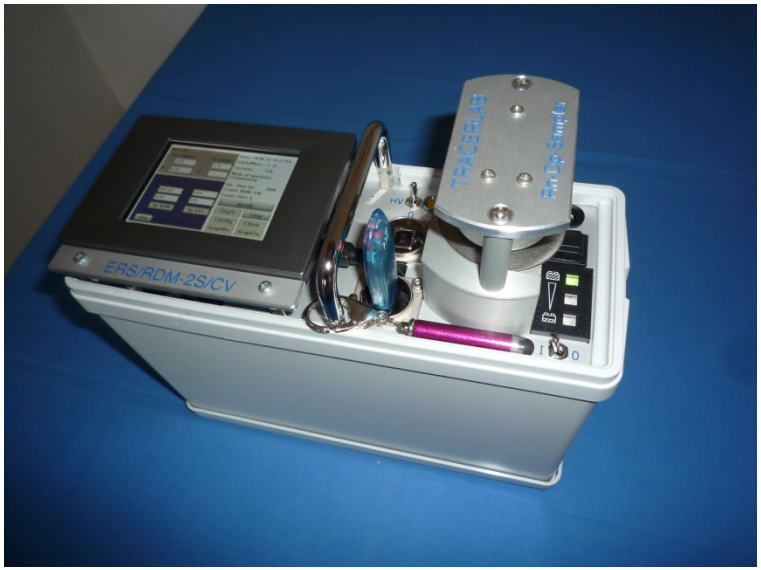
For the determination of the Radon/Thoron-Progeny-Concentration, ambient air is sucked by the internal air-suction-pump with an air-flow-rate of appr. 120 l/h trough the membrane-filter of the independent Sampler.
The filter is placed in the holding-device under the Alpha-Sensitive Detector (Canberra PIPS-Detector).
There is the collection of Po-218 for the determination of the Radon-Progenies and Po-212 (decay-product of Po-216) for the determination of the Thoron-Progenies.
The mode of operation can be selected, such as the Continuous-, Nuclide-Specific-, or the Markov-Method.

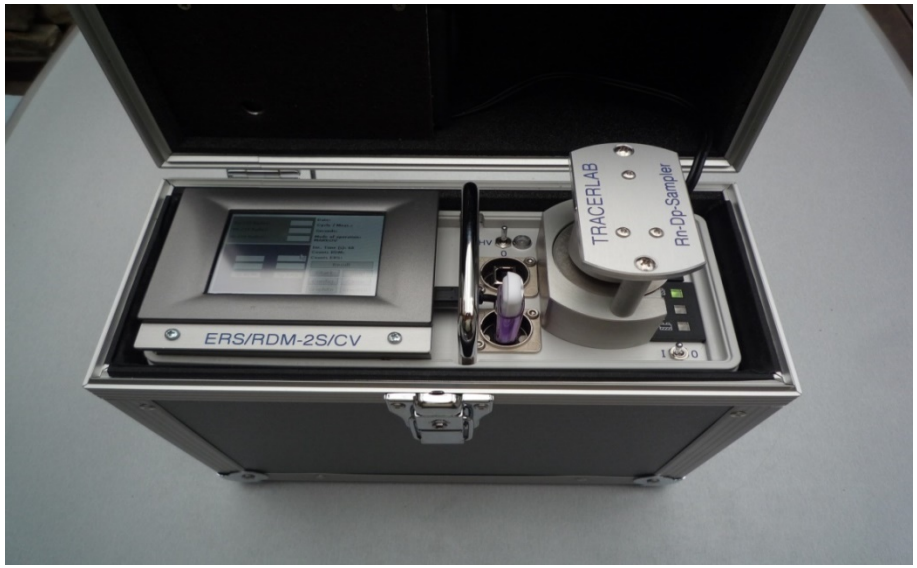
Operational dimensions and weight: 325 x 255 mm, x 155 mm high, 7,5 Kg
Electric power supply: Li-Ion-Battery, 14,4 V / 8,7 Ah, incl. charger.
Runtime without AC-line connection to the charger: > 10 h

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

ERS/RDM-2S/CV – the compact version of a Radon/Thoron- and Progeny-Monitor





The ERS/RDM-2S/CV is a new designed portable, real-time and direct reading dual-channel Radon/Thoron- and Radon/Thoron-Daughter-Working-Level-Monitor. The easy handling, light-weight „All-In-One - Take-Away“ Instrument for an excellent use in a mine, cave, or at other places.
It has a built-in counting-chamber as an Electrostatic-Radon-Sampler with a volume of 200 ml for the determination of the Radon/Thoron-Concentration and a built-in sampler with a removable filter-holding device for the determination of the Radon/Thoron-Progeny-Concentration.
The display of the Panel-TPC shows the actual calculated results for Rn-222, Rn-220 and the Equilibrium Factor „F“. The systems configuration can be arranged as well with the Panel-TPC.

ERS/RDM-2S/CV – the compact version of a Radon/Thoron- and Progeny-Monitor

The ERS/RDM-2S/CV is the compact version of an "all-in-one" active and direct reading Dual-Channel Radon/Thoron- and Radon/Thoron-Progeny-Monitor.
The operation of the ERS/RDM-2S/CV is by using the integrated Panel-TPC.

For the determination of the Radon/Thoron-Concentration, it is working as an Electrostatic-Radon-Sampler with a metallic hemisphere / counting-chamber of 200 ml volume and a positive High-Voltage of 1,5 kV connected to the metallic hemisphere. An Alpha-Sensitive Detector (Canberra PIPS-Detector) is built-in isolated on negative potential in the counting-chamber. Radon containing ambient air is sucked by the internal air-suction pump with an airflow-rate of appr. 120 l/h through the membrane-filter (as a pre-filter) of the built-in Radon/Progeny-Sampler.
The intelligent data collection with an alpha-spectroscopy-system, MCA with 256 channels, ADC, Pre- and Main-Amplifier is made for the collection of Po-218 for the determination of Radon and Po-216 for the determination of Thoron.

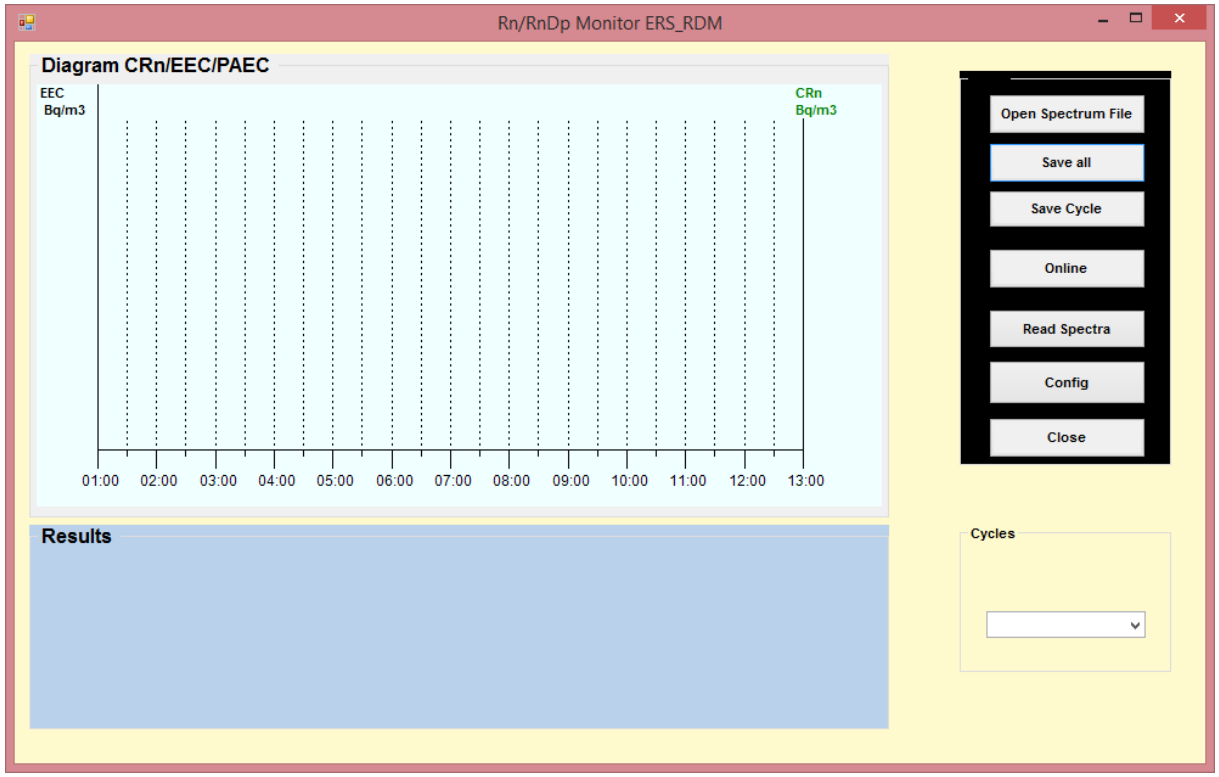
For the determination of the Radon/Thoron-Progeny-Concentration, ambient air is sucked by the internal air-suction-pump with an air-flow-rate of appr. 120 l/h trough the membrane-filter of the built-in Sampler.
The filter is placed in the holding-device under the Alpha-Sensitive Detector (Canberra PIPS-Detector).
There is the collection of Po-218 for the determination of the Radon-Progenies and Po-212 (decay-product of Po-216) for the determination of the Thoron-Progenies.
The mode of operation can be selected, such as the Continuous-, Nuclide-Specific-, or the Markov-Method

Operational dimensions and weight: 255 x 105 mm, x 240 mm high, 4,0 Kg
Electric power supply: Li-Ion-Battery, 14,4 V / 8,7 Ah, incl. charger.
Runtime without AC-line connection to the charger: > 14 h

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Dual-Channel Radon/Thoron- and Progeny-Monitors / PC-Application Software

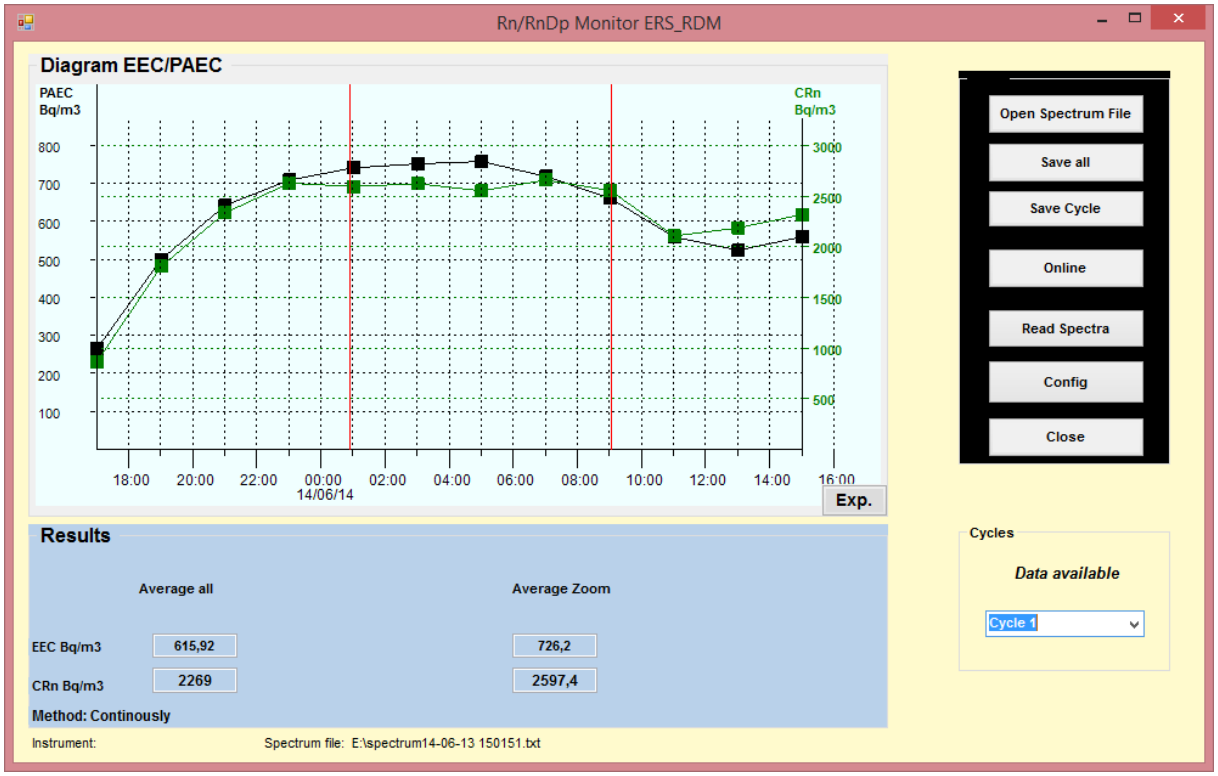


The PC-Application-Software can be used on an external PC under Windows XP, Windows 7 and Windows 8.
An ERS/RDM-2S or ERS/RDM-2S/CV can be connected for a direct online-operation.
For the evaluation of measurement-data by using the PC-Application-Software, the ERS/RDM-2S or the ERS/RDM-2S/CV can be connected for an online / direct-reading of collected data from the systems memory, or already collected data can be read-in for the data-processing.

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Dual-Channel Radon/Thoron- and Progeny-Monitors / PC-Application Software

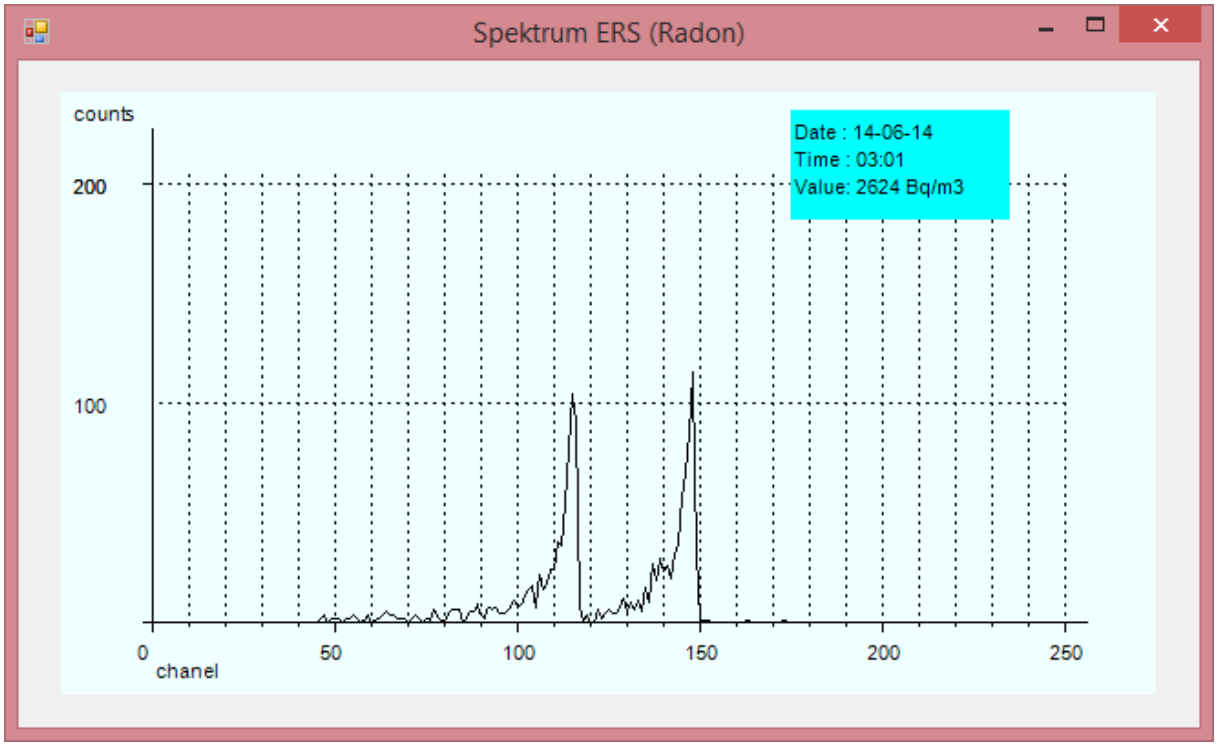


The PC-Application-Software for the ERS/RDM-2S or ERS/RDM-2S/CV has a zoom-function, to select specific measurements, or all of the collected data from measurements, for the evaluation of data-processing

TRACERLAB

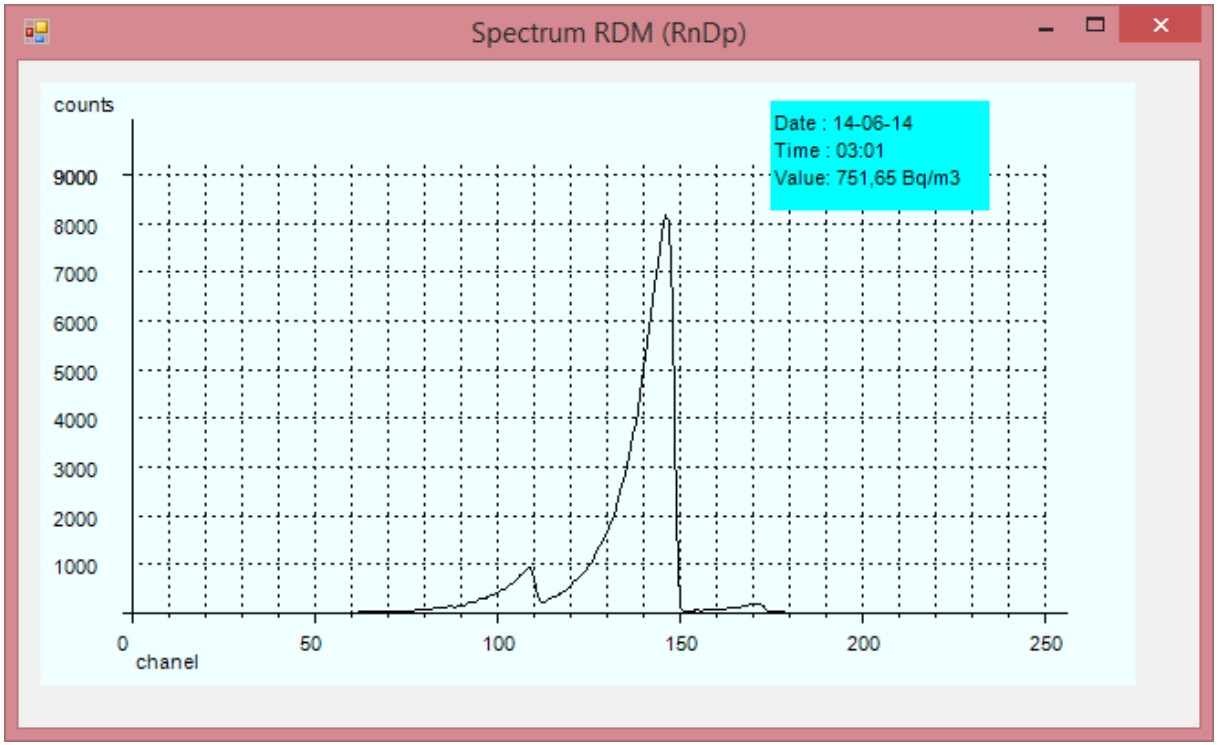
Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

Dual-Channel Radon/Thoron- and Progeny-Monitors / PC-Application Software



A typical collected Radon-Spectrum of the ERS/RDM-2S or ERS/RDM-2S/CV

Dual-Channel Radon/Thoron- and Progeny-Monitors / PC-Application Software



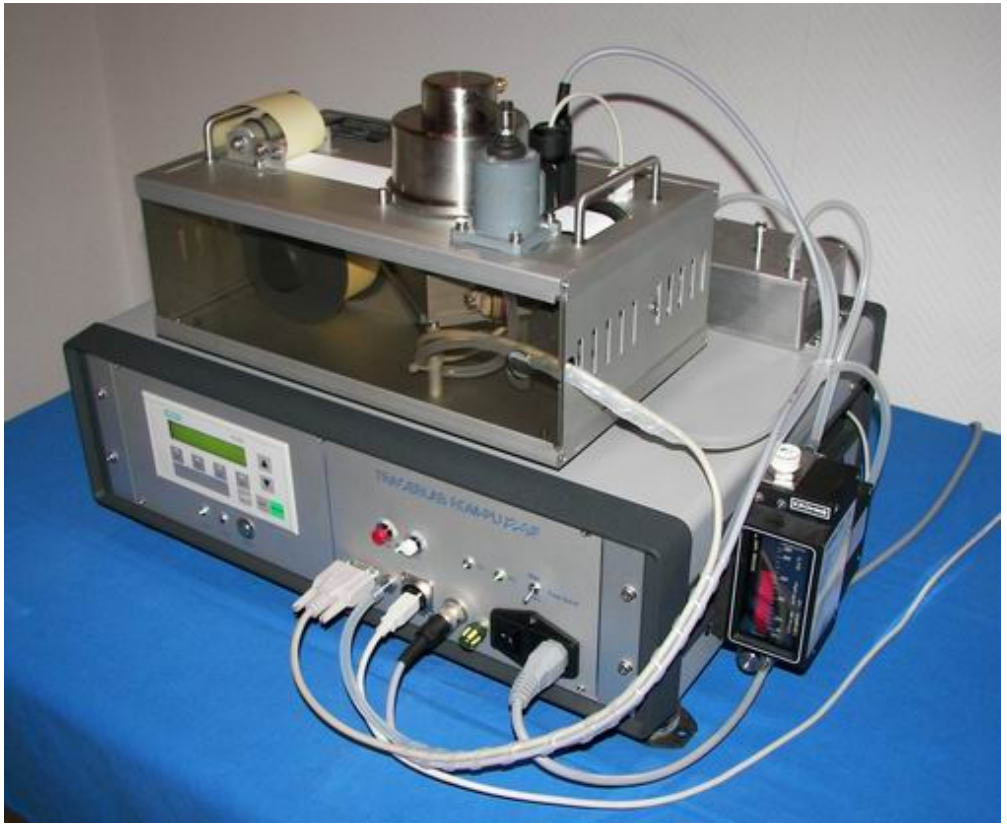
A typical collected Radon-Progeny-Spectrum of the ERS/RDM-2S or ERS/RDM-2S/CV

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

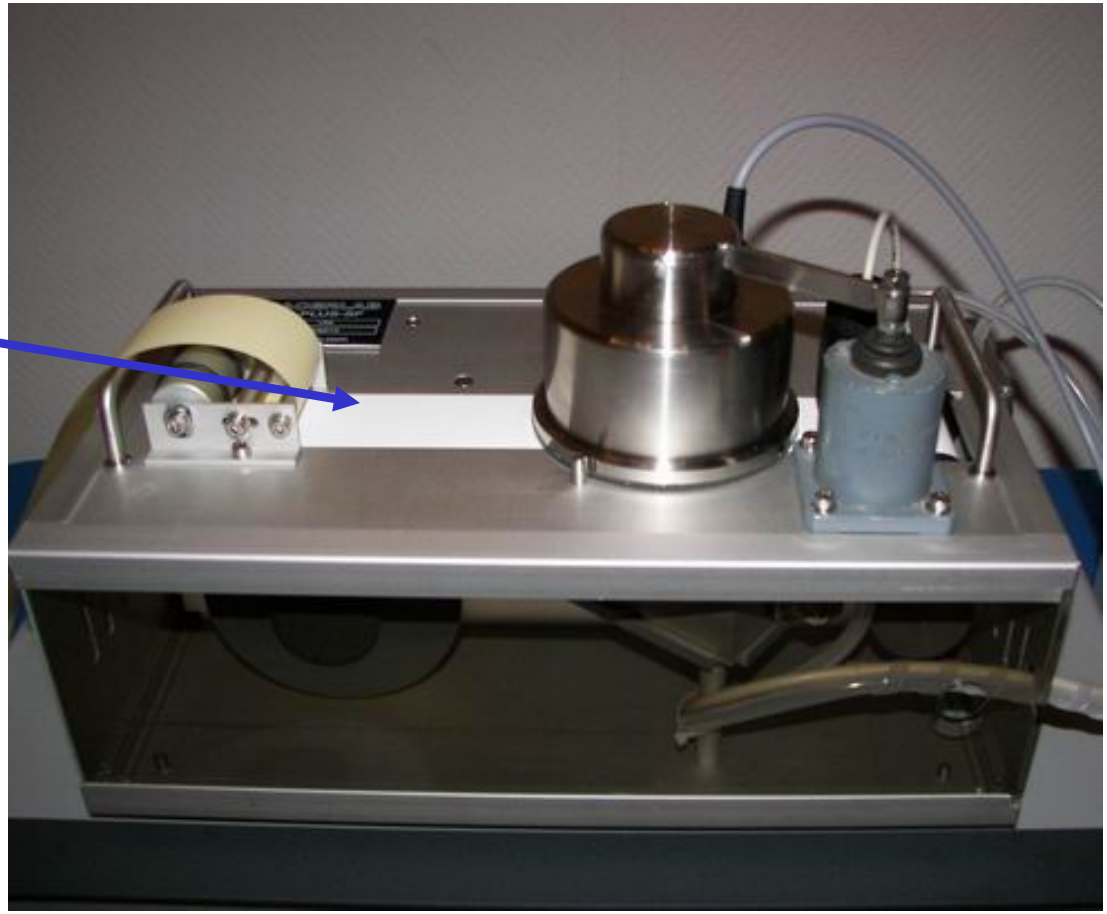
Special application:
RDM-PLUS-SF
Single channel
Automatic-Step-Filter
Radon Daughter Monitor

Automatic-Step-Filter-System, for the determination of the Radon/Thoron-Progeny Concentration, made as a self contained system or for an installation as a station.
Standard version with a built-in air-suction-pump for appr. 120 l/h, or Low-Level-Version with a high-air-flow-pump for up to 800 l/h, to reach a very low limit of detection.
Selection of the spepping-intervall and of the counting-intervall at each step.
An automatically evaluated result is given at each counting-intervall.



Operational dimensions and weight:
basic 19” Rack with the built-on Step-Filter-Unit, appr. 20 Kg
Electric power 100 – 240 V AC

Automatic-Step-Filter System



TRACERLAB

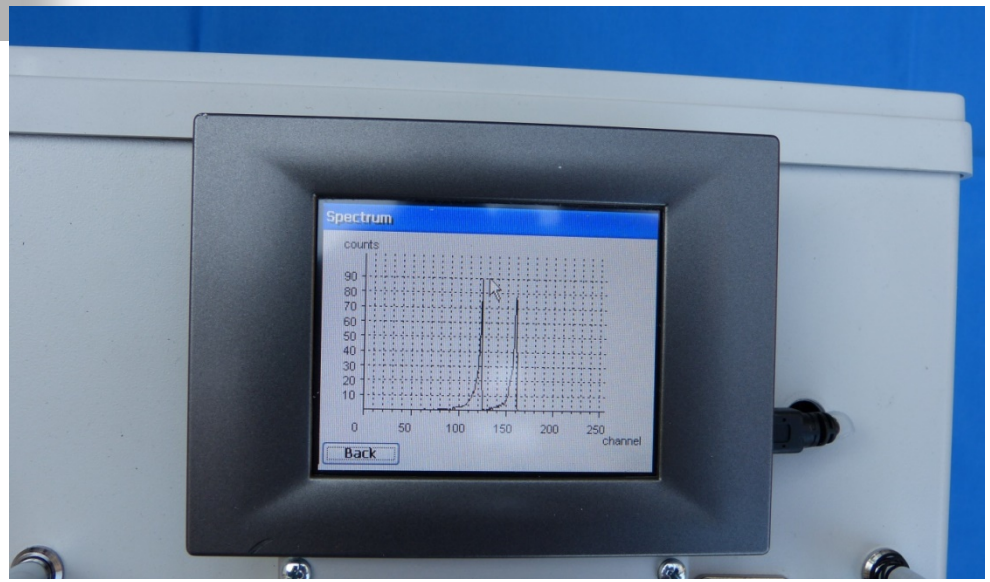
Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

System Configuration with the Panel-TPC:

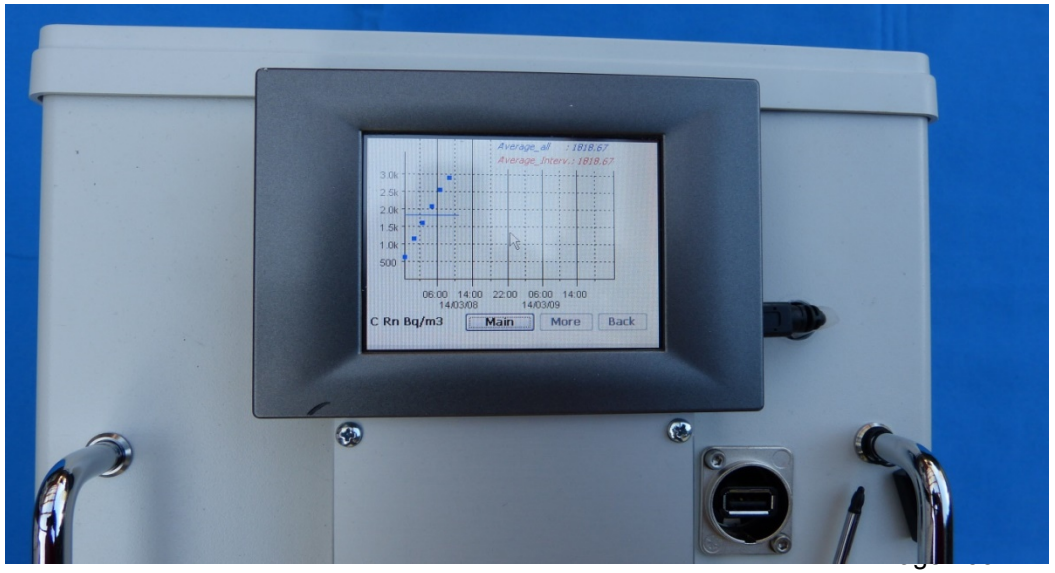
- select the mode of operation and setup of the counting intervall
- select the units of the Radon/Thoron-Concentration
- data storage on Hard-Disk, USB-Momory-Stick, or SD-Card
- display of the graph of the last collected spectrum (QS)
- display of the time-depending graph of collected results
- display of an actual result, automatically, or independently of the preset counting interval

TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies



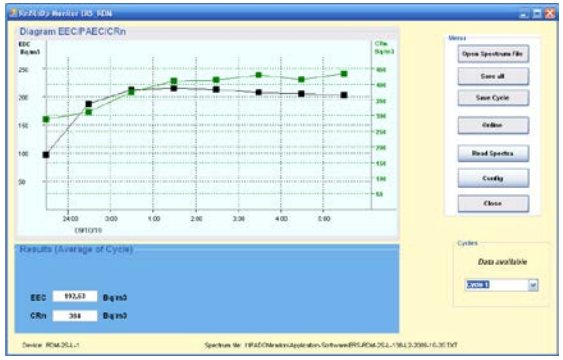
All of the new, active, real-time and direct reading Radon-Monitors are designed with the integrated Panel-TPC for setting of parameters, reading of results, display of spectrum-graphic and display of time-depending graphic-results



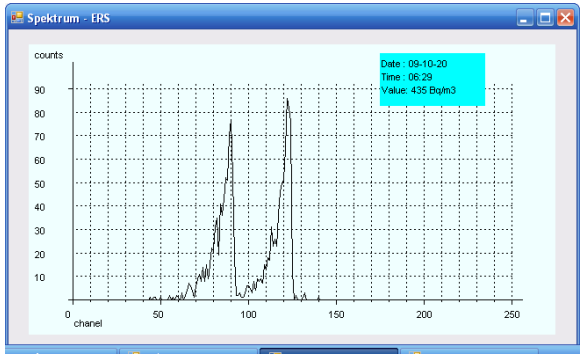
TRACERLAB

Natural Radiation, the Determination of Radon, Thoron and it‘s Progenies

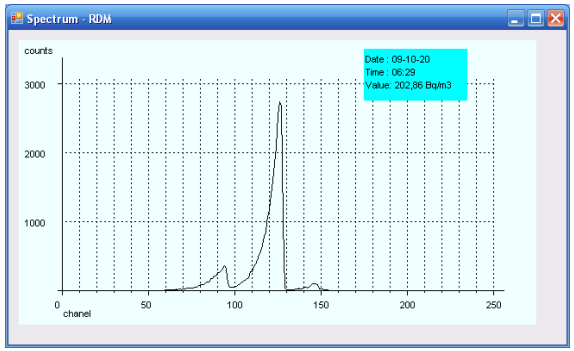
The operation of the single-channel or dual-channel Radon/Thoron-Monitors, or Radon/Thoron-Daughter-Working-Level-Monitors at the advanced version with the Panel-TPC is for settings, communication, display of evaluated results and storage of collected data.
The handling of the collected data is by using the application software with an External PC-System for listing, storage and graphic-design.



ERS-RDM Monitors,
dual-channel version graphic display of results



Single-channel ERS-Monitors,
or dual-channel ERS/RDM-Monitors,
Display of a typical Radon-Spectrum



Single-channel, or dual-channel
BWLM and RDM Monitors, Display
of a typical Radon-Progeny Spectrum