RTM 2200 Radon/Thoron monitor –" System in a box" for complex sampling procedures and multi parameter analysis

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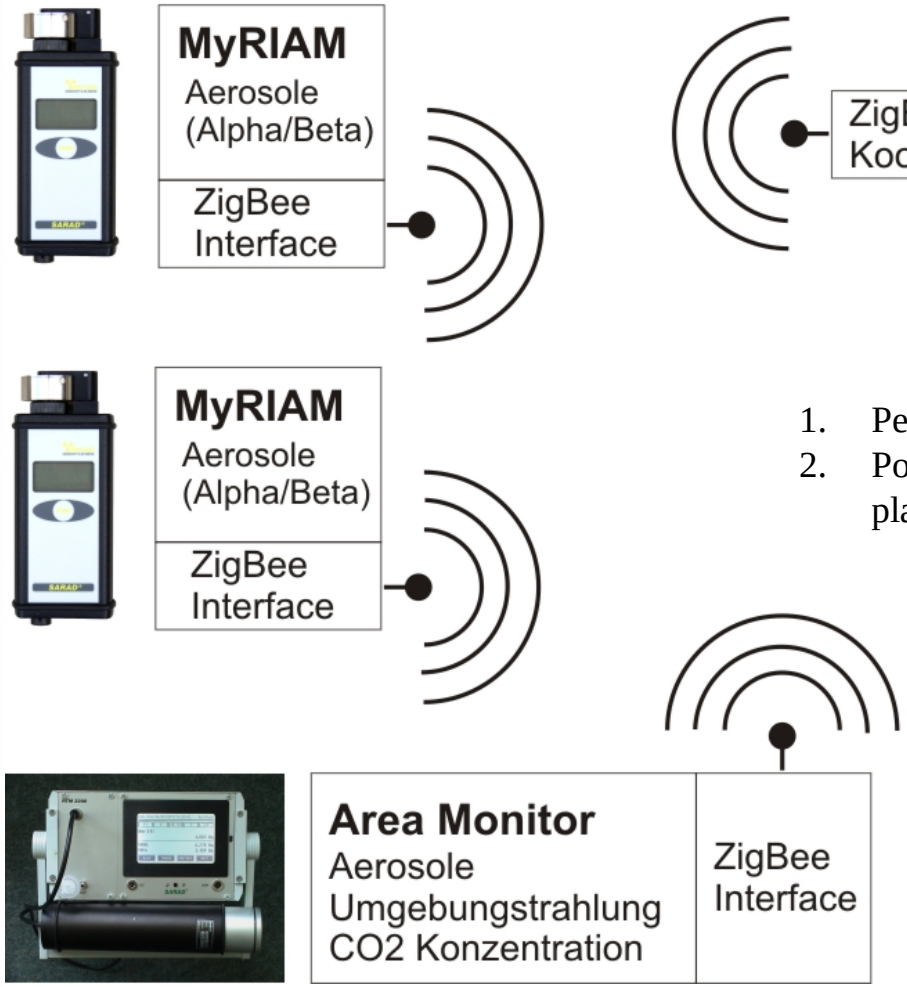
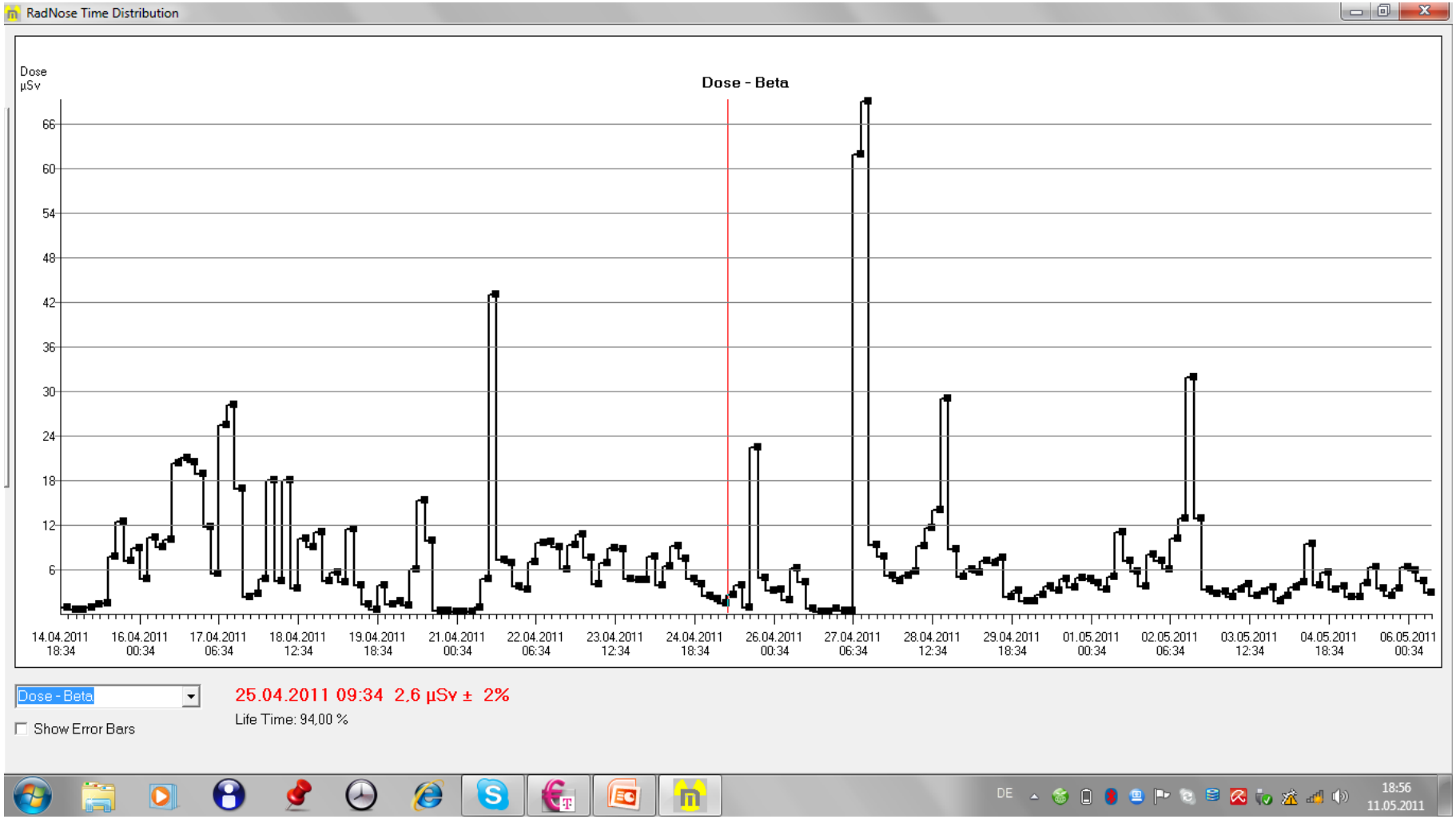
Selbstorganisierendes Sensor-Netzwerk



1. Personengebundene Sensoren/Detektoren
2. Portable Monitore, die bei Bedarf an verschiedenen Orten platziert werden können

Inhalationsdosisverlauf in der Nähe von Fukushima/Japan



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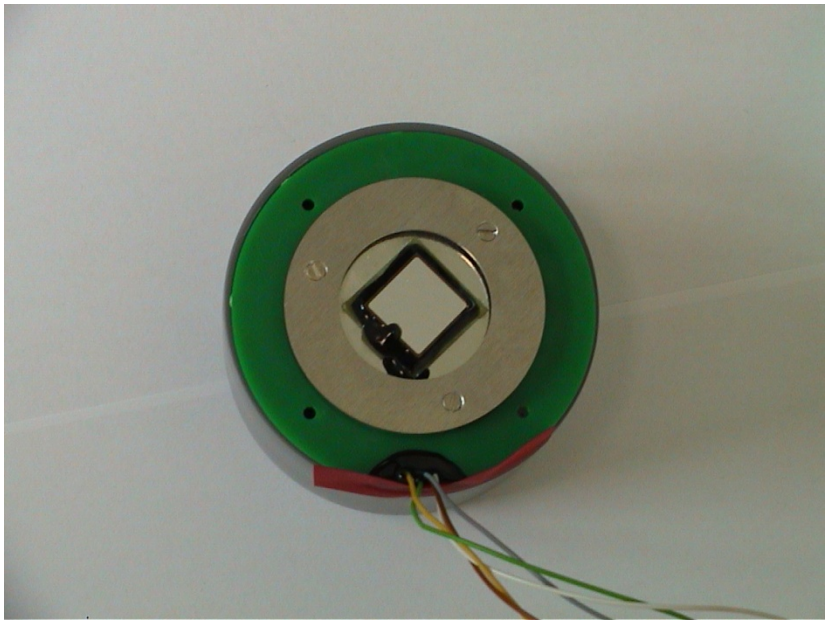
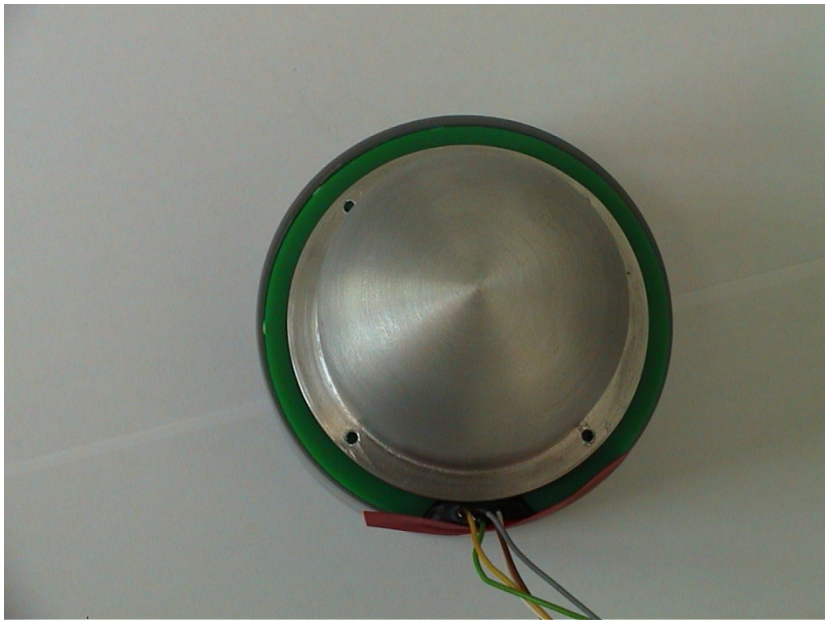
Measuring chamber soil gas probe





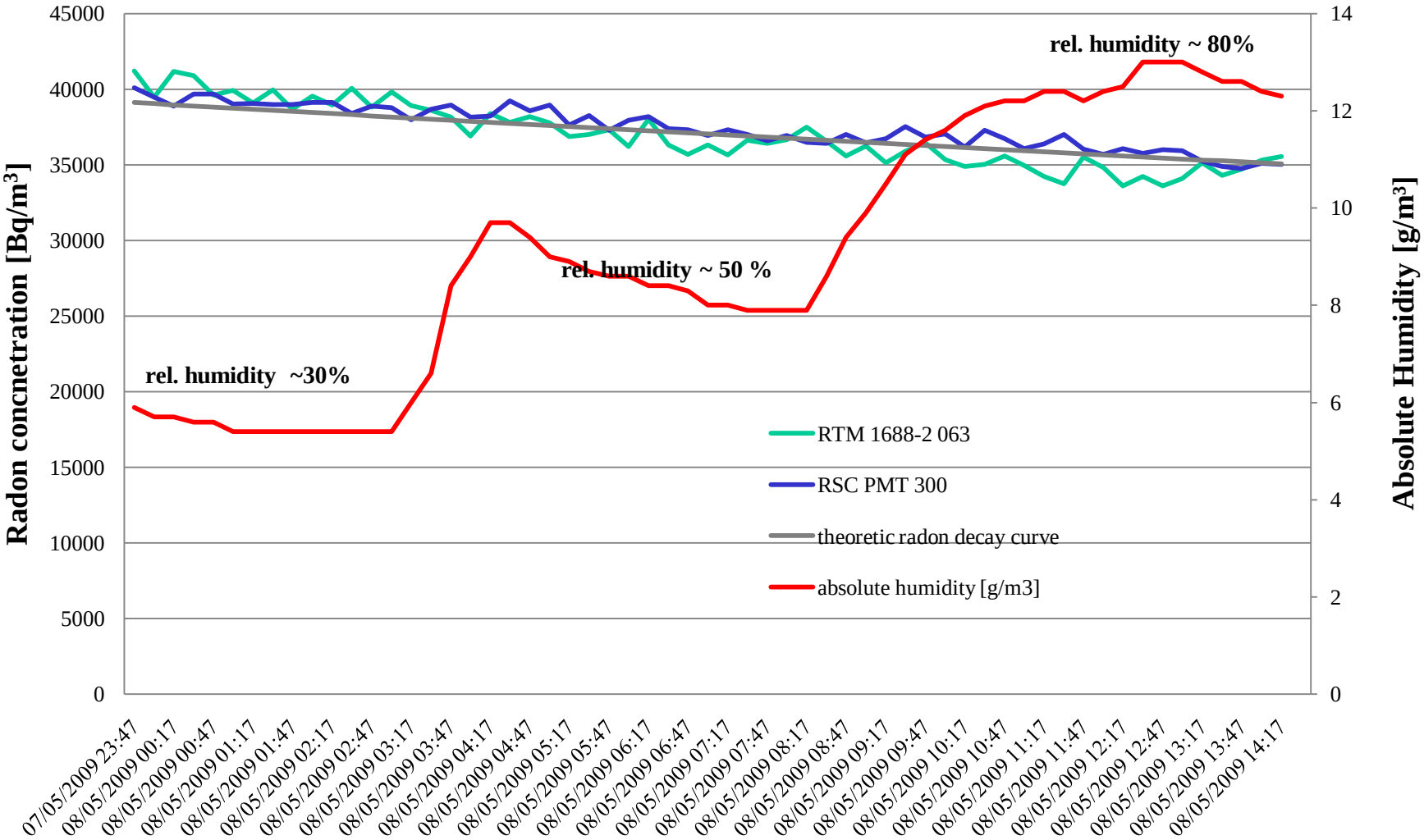
Measuring chambers RTM 2100

Radon Scout PLUS

Radon Scout

Radon Scout PMT with Lucas cell

test of humidity influence by 20 C



RTM1688-2 Geostation

A full water tight system including soil probe,
contain radon/thoron sensor, humidity, temperature, air pressure, tilt

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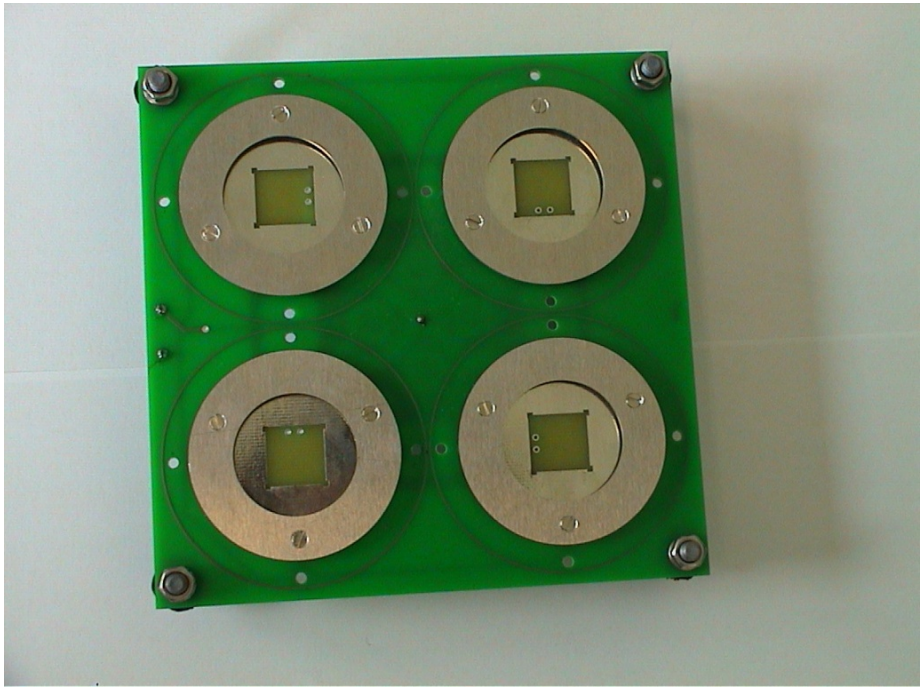
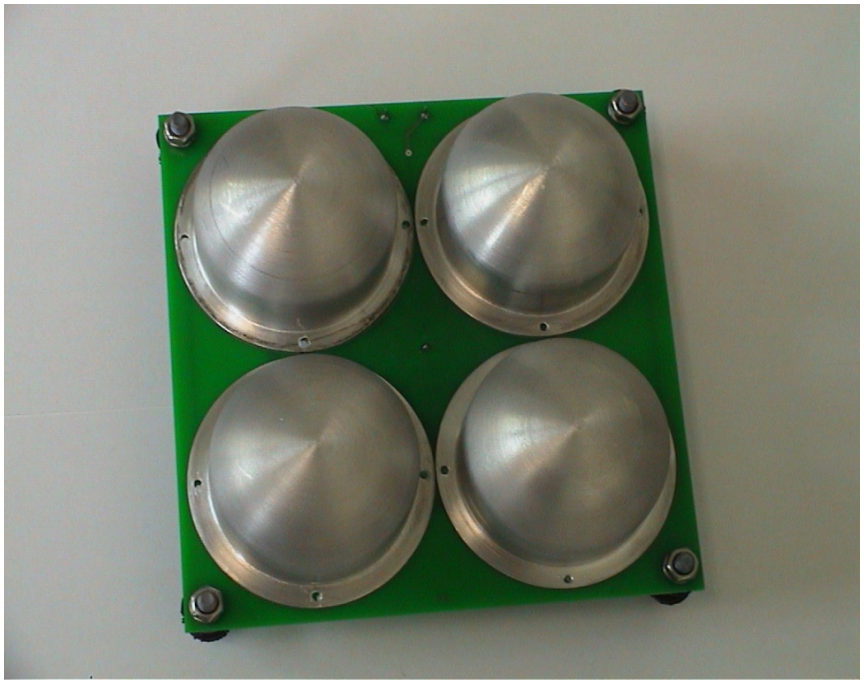
Soil gas probe on a Fumarole near Taipei

Measuring chambers of RTM1688-2





Radon / Thoron monitor RTM 1688-2

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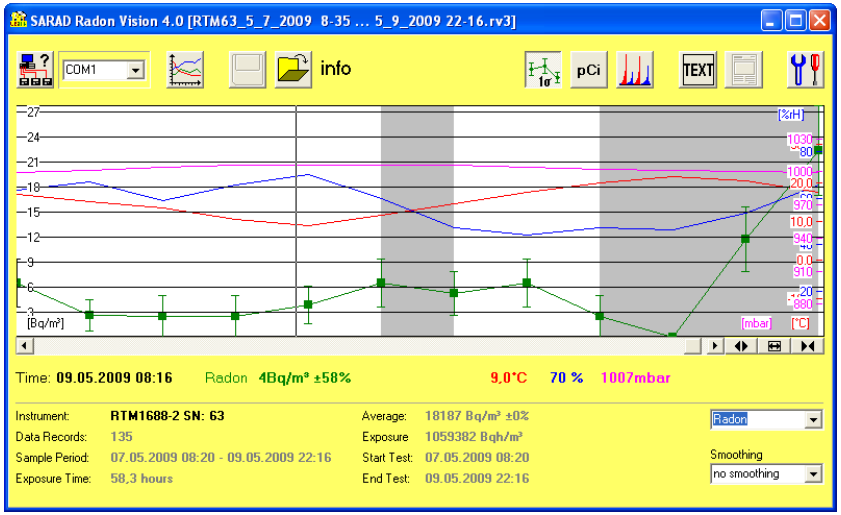
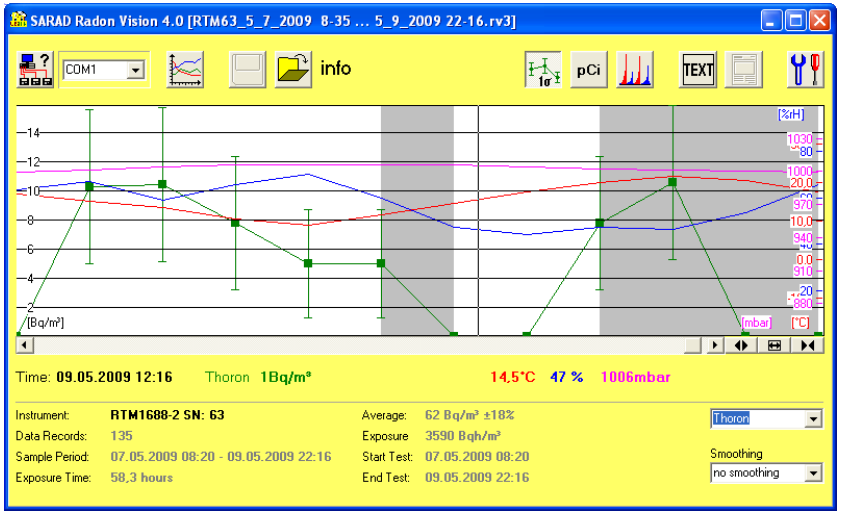
Outdoor measurement with RTM1688-2 and DOSEMAN Pro

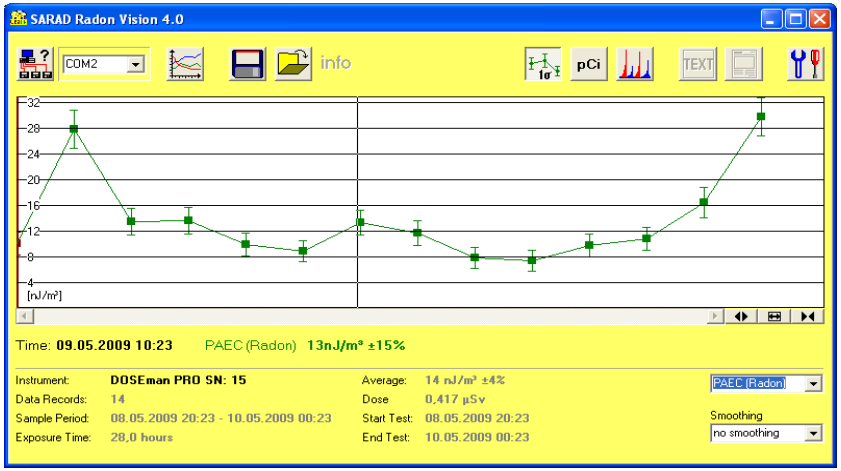
Radon



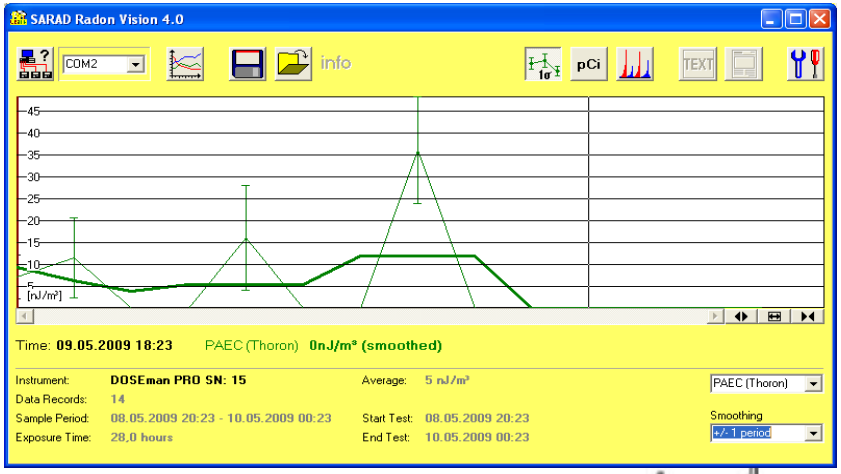
Thoron

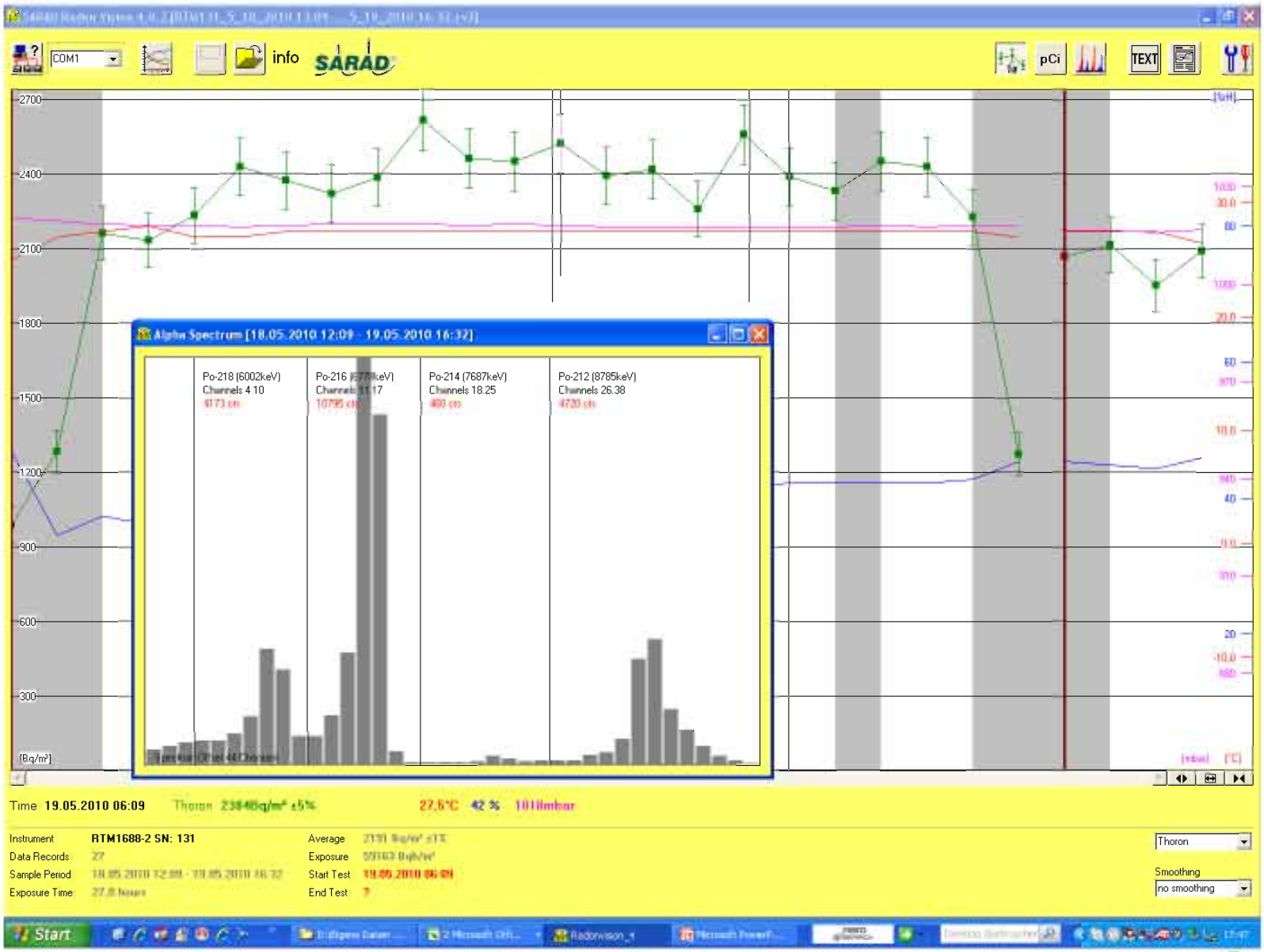


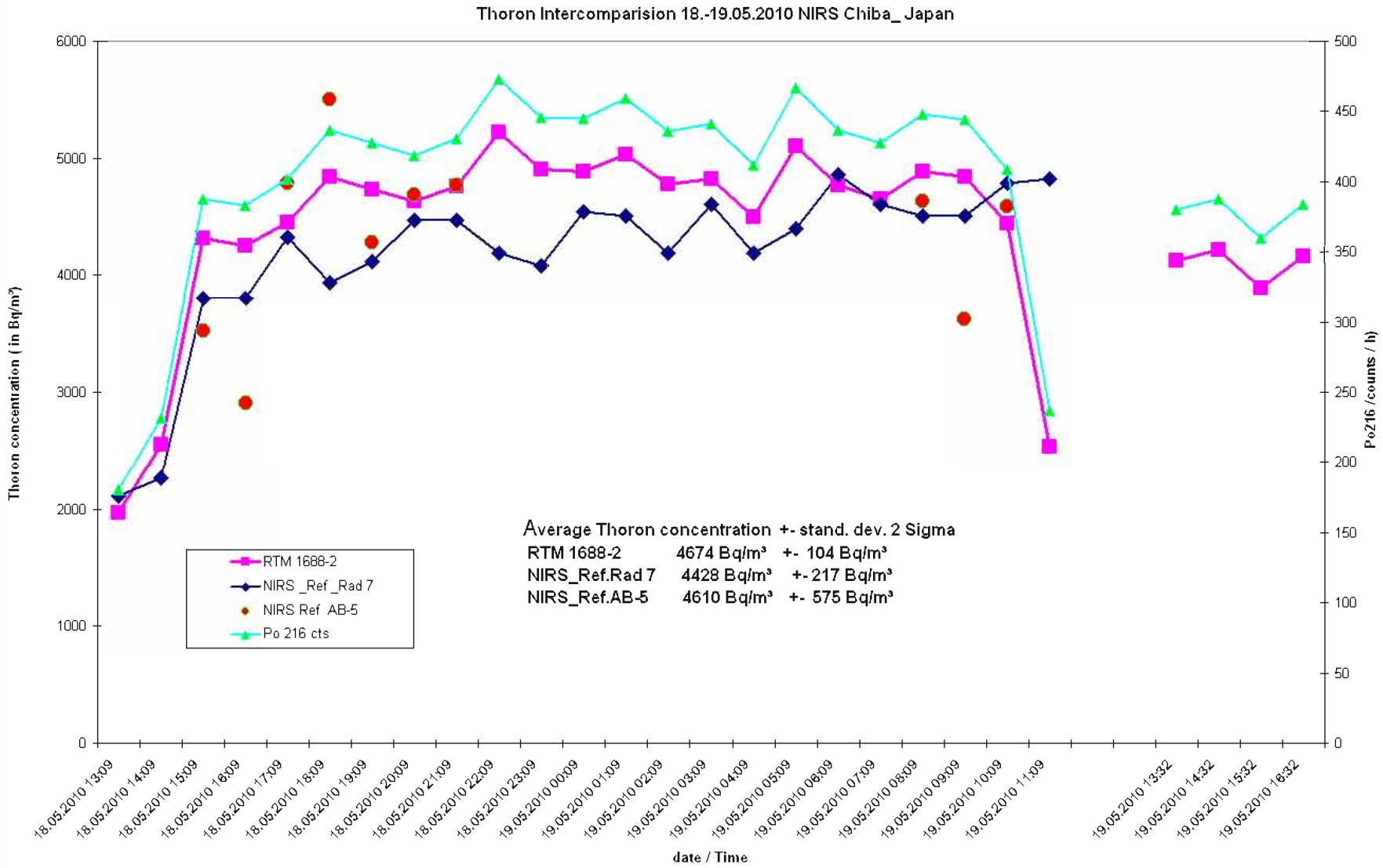
Radon decay products PAEC



Thoron decay products PAEC



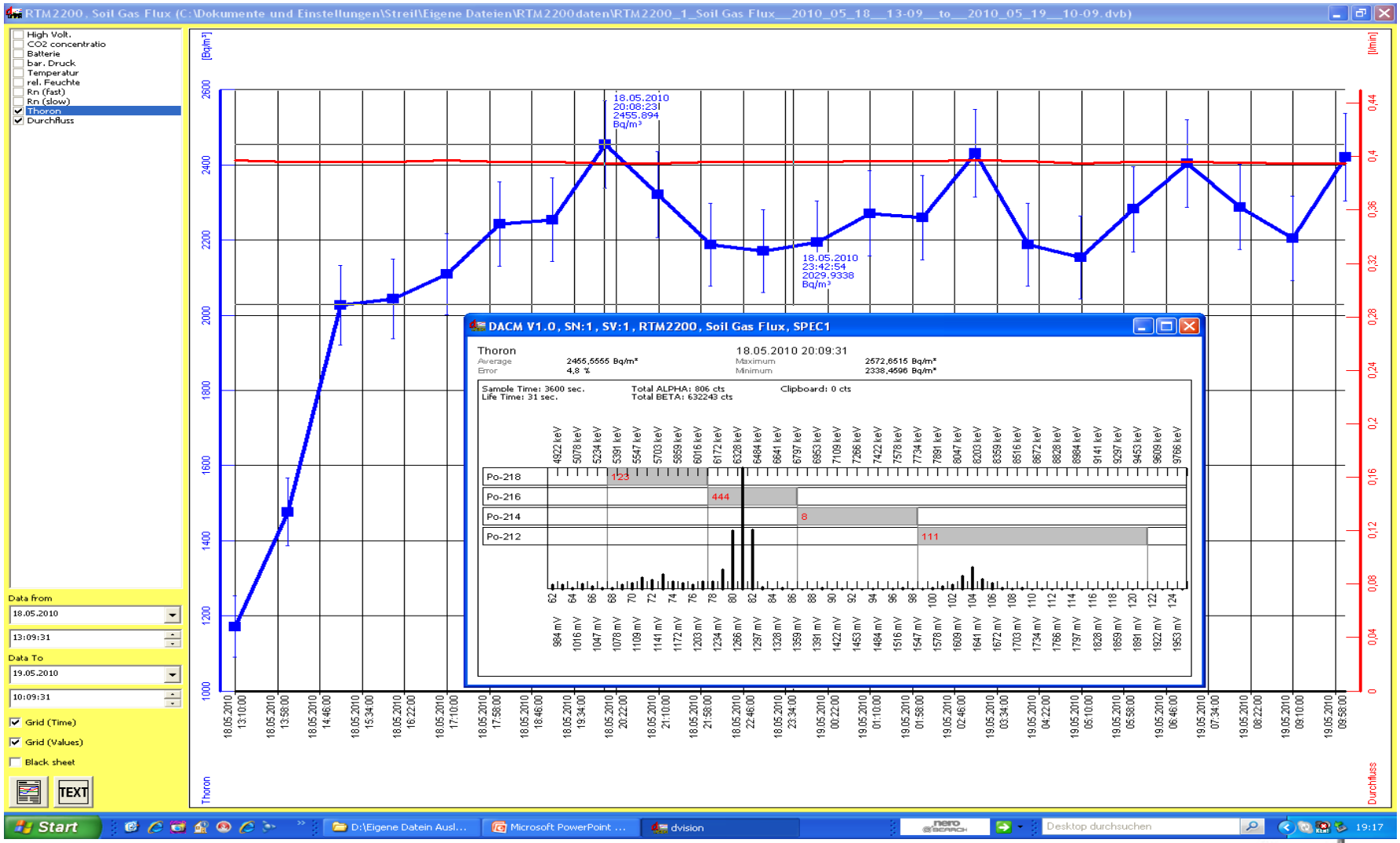

COM1
info
SARAD
pCi
TEXT
2700
2400
2100
1800
1500
1200
900
600
300
(Bq/m³)
Alpha Spectrum [18.05.2010 12:09 - 19.05.2010 16:32]
Po-218 (6002keV)
Channels 4.10
Po-216 (6778keV)
Channels 11.17
Po-214 (7687keV)
Channels 18.25
Po-212 (8785keV)
Channels 26.38
Time 19.05.2010 06:09
Thoron
22,6°C 42 % 1011mbar
Instrument RTM1688-2 SN: 131
Data Records 27
Sample Period
Exposure Time 27.0 hours
Average
Exposure
Start Test
End Test ?
Thoron
Smoothing
no smoothing
Start


Thoron Intercomparision 18.-19.05.2010 NIRS Chiba_ Japan
Thoron concentration (in Bq/m³)
Po216 /counts / h)
date / Time
RTM 1688-2
NIRS _Ref _Rad 7
NIRS Ref AB-5
Po 216 cts
Average Thoron concentration +- stand. dev. 2 Sigma
RTM 1688-2 4674 Bq/m³ +- 104 Bq/m³
NIRS_Ref.Rad 7 4428 Bq/m³ +- 217 Bq/m³
NIRS_Ref.AB-5 4610 Bq/m³ +- 575 Bq/m³


Hauptmenue
Messung angehalten
RTM2200
Standard
11.09.2009
Zyklus: Intern+CNT1+DIN1
START
ZYKLUS
INTERVALL
INFO

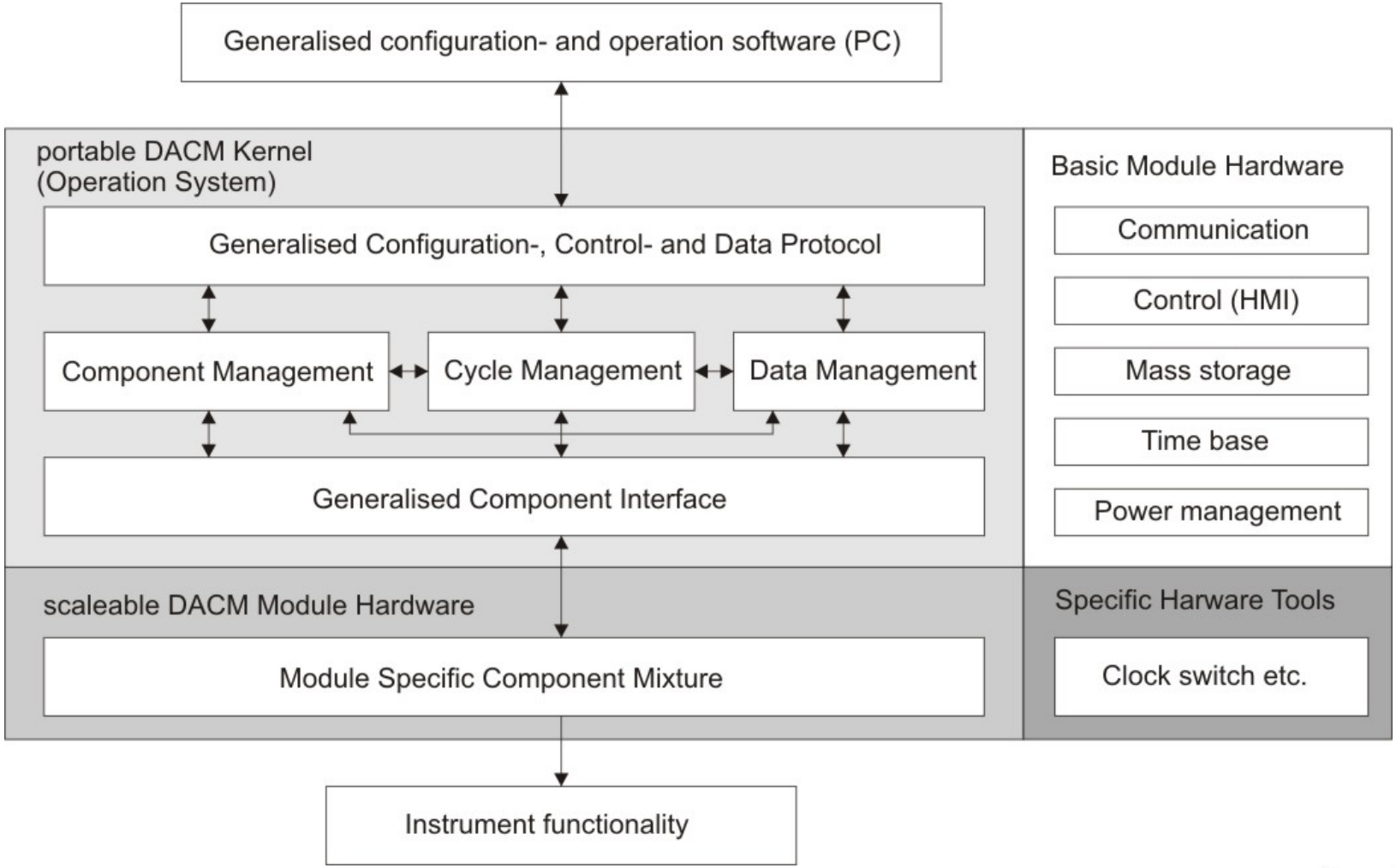

Aktueller Messwert
Dust chamber
Radon
1176.471 Bq/m3
ZURUECK
LETZTE
NAECHSTE

Intercomparision NIRS average Thoron conc. 4522 Bq/m³ +-102Bq/m3

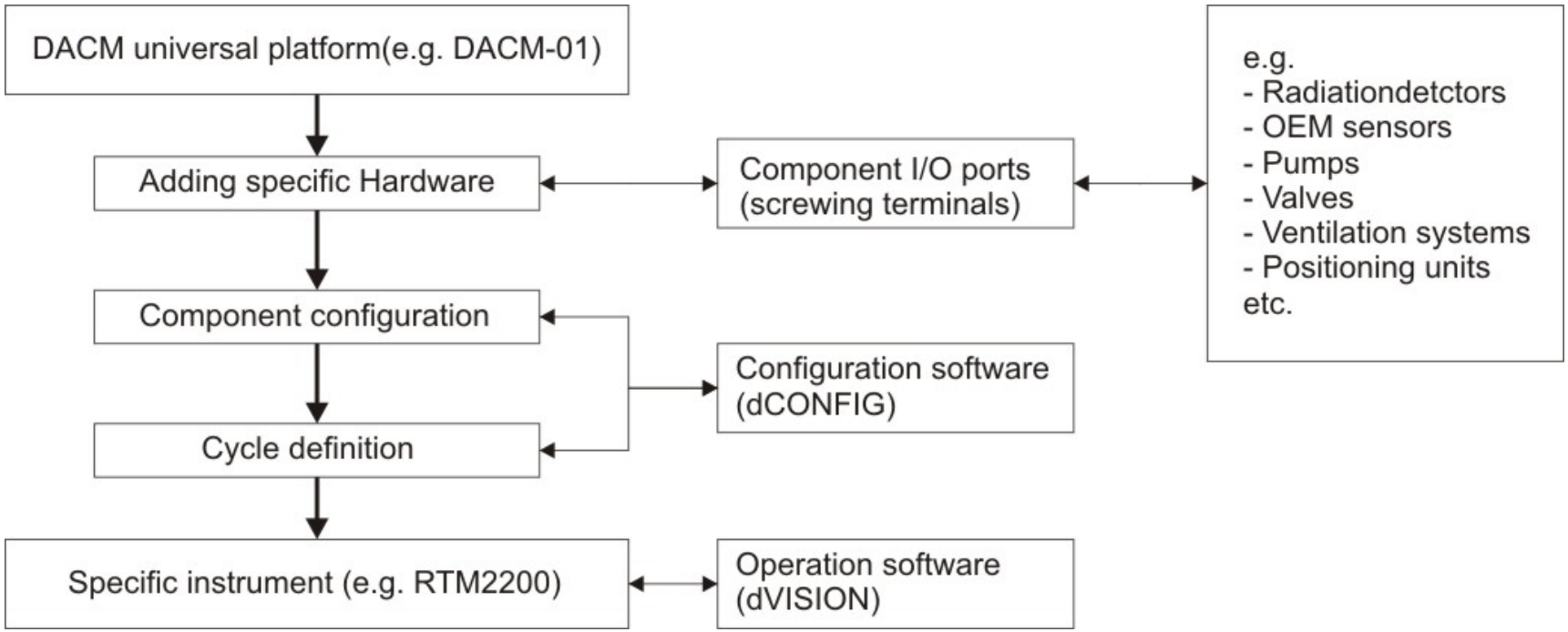


NIRS_Ref.Rad 7	4428 Bq/m³	+- 217 Bq/m³
NIRS_Ref.AB-5	4610 Bq/m³	+- 575 Bq/m³

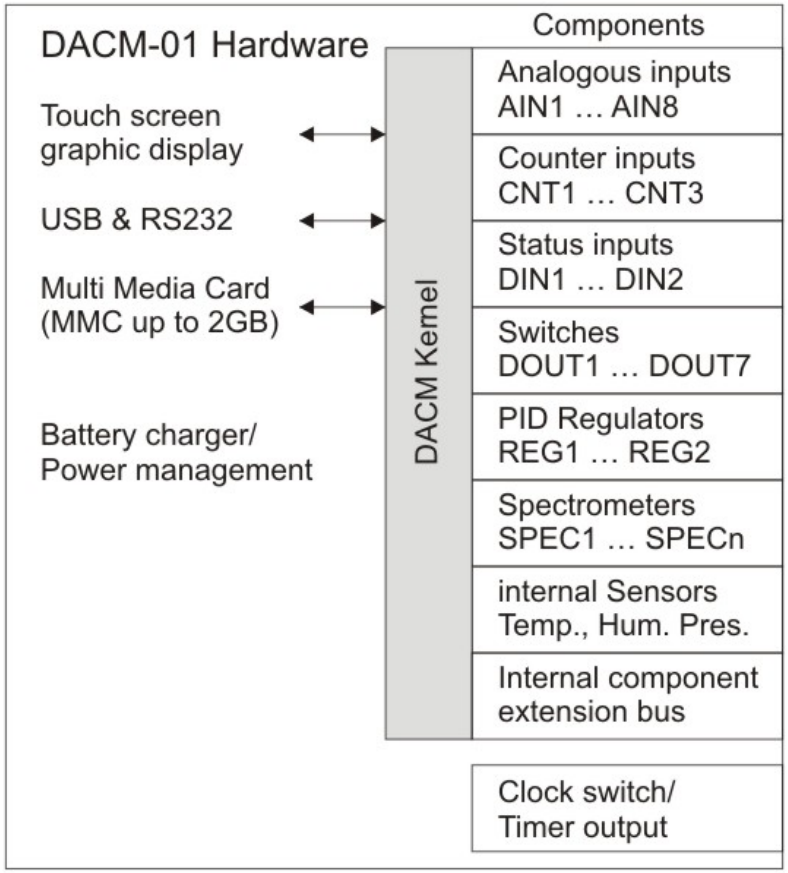
DACM System topology



Instrument synthese



DACM-01 Hardware implementation



sensors with analogous output signal (volt./current)

velocidy sensors, flow meters, wind speed, nuclear sensors

door/window contacts, ventilation status signals

pumps, motors, ventilation, positionning, stepping

flow regulators, level regulators etc.

nuclear detectors (Semiconductors, Scintillators, Ionisation chambers)

“on board” sensors for general information

protocol bridges, GPS modules, intelligent sensors etc.

Modem power, cyclic discharge control etc.

Component Type Definition

→ **Disconnects component functions from their hardware implementation!**

Component properties

- Identification (names, codes etc.)
- Possible states of the component type within the cycle (ON/OFF, set-points etc.)
- Data and alert handling

Configuration structure

- Definition of the parameter set, later offered to the user (names, units, transfer characteristics, result selection, calibration constants etc.)

Data structure

- Memory space allocation for basic data
- Calculation rules and procedures for results
- General result data format

Benefits for

Manufacturer:

New components can be defined or derived by extension
Components can be implemented to any hardware platform
Instrument specific component sets possible (several types and numbers)
Hardware independent configuration and operation software (PC)

User:

full control over the whole instrument functionality
simple re-configuration and extension without manufacturer
Generalised data base for generated results (from simple to very complex)

DACM Dual software concept

Administrator

DACM based instrument looks like
a powerful, universal toolbox

Simple configuration interface, administrator knows the structure of the instrument and the intention of the measurement procedure

Configuration Software

- Cycle Definition
- Component Configuration
- Calibration work / Testing

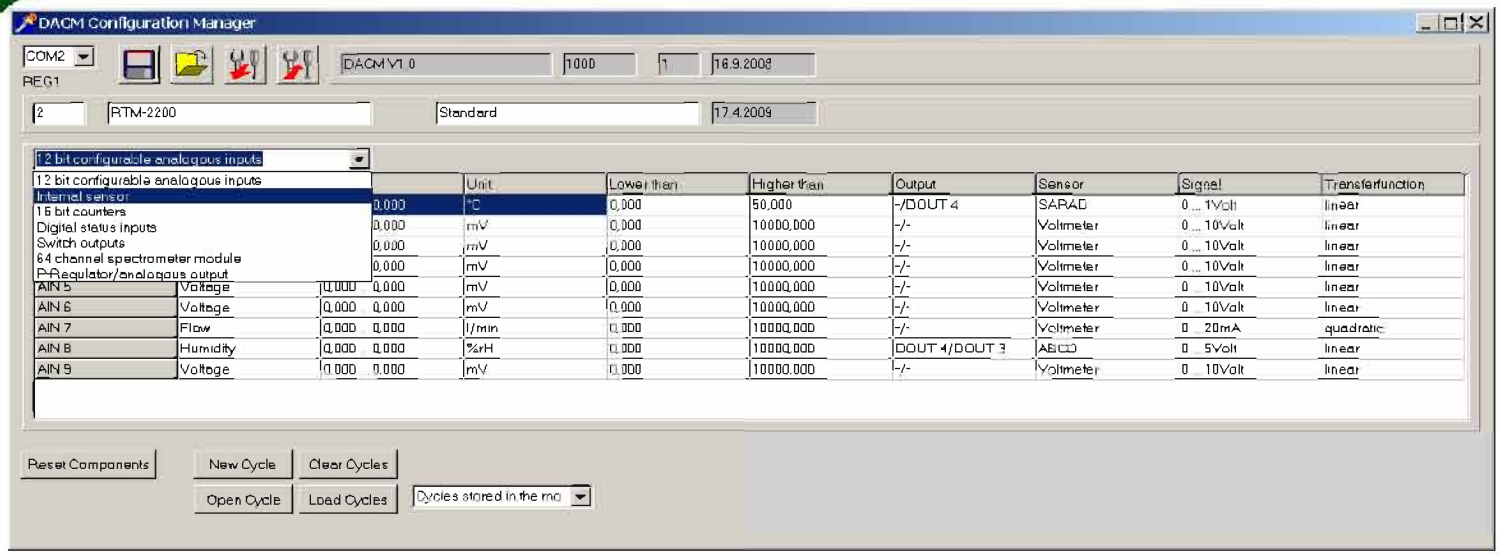
Operator

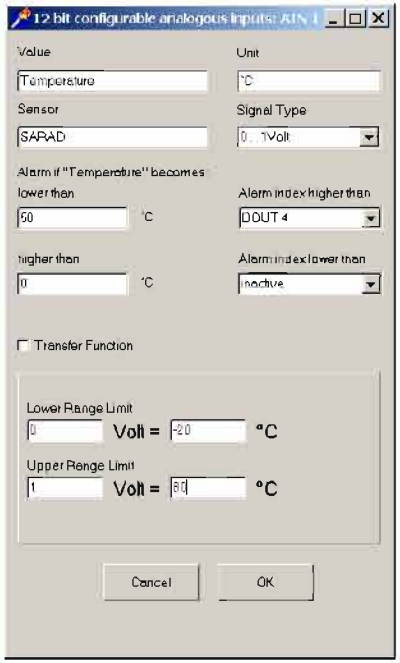
DACM based instrument looks like
a simple, ready to use instrument

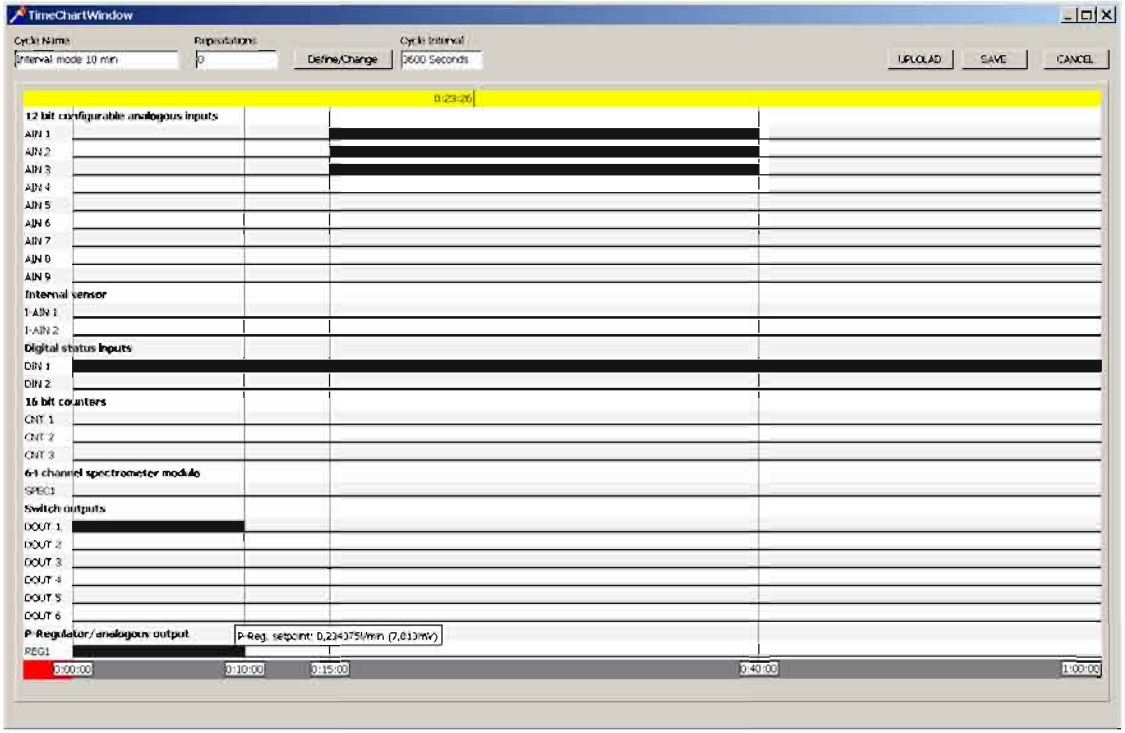
No knowledge about internal functions required

Operation Software

- Module Setup
- Cycle Selection
- Data Handling
- Visualisation/Analysis


DACM Configuration Manager
COM2
REG1
DACM V1.0
1000
1
16.9.2008
2
RTM-2200
Standard
17.4.2009
12 bit configurable analogous inputs
Internal sensor
16 bit counters
Digital status inputs
Switch outputs
64 channel spectrometer module
P-Regulator/analogous output
Unit
Lower than
Higher than
Output
Sensor
Signal
Transferfunction
AIN 5 Voltage 0,000 0,000 mV 0,000 10000,000 -/- Voltmeter 0 ... 10Volt linear
AIN 6 Voltage 0,000 0,000 mV 0,000 10000,000 -/- Voltmeter 0 ... 10Volt linear
AIN 7 Flow 0,000 0,000 l/min 0,000 10000,000 -/- Voltmeter 0 ... 20mA quadratic
AIN 8 Humidity 0,000 0,000 %rH 0,000 10000,000 DOUT 4/DOUT 3 ASCII 0 ... 5Volt linear
AIN 9 Voltage 0,000 0,000 mV 0,000 10000,000 -/- Voltmeter 0 ... 10Volt linear
Reset Components
New Cycle
Clear Cycles
Open Cycle
Load Cycles
Cycles stored in the mo


12 bit configurable analogous inputs AIN 1
Value
Temperature
Unit
°C
Sensor
SARAD
Signal Type
0 ... 1Volt
Alarm if "Temperature" becomes
lower than
50
°C
Alarm index higher than
DOUT 4
higher than
0
°C
Alarm index lower than
inactive
Transfer Function
Lower Range Limit
0
Volt =
-20
°C
Upper Range Limit
1
Volt =
80
°C
Cancel
OK


TimeChartWindow
Cycle Name
Interval mode 10 min
Repetitions
0
Define/Change
Cycle Interval
3600 Seconds
UPLOAD
SAVE
CANCEL
0:23:26
12 bit configurable analogous inputs
AIN 1
AIN 2
AIN 3
AIN 4
AIN 5
AIN 6
AIN 7
AIN 8
AIN 9
Internal sensor
I-AIN 1
I-AIN 2
Digital status inputs
DIN 1
DIN 2
16 bit counters
CNT 1
CNT 2
CNT 3
64 channel spectrometer module
SPEC1
Switch outputs
DOUT 1
DOUT 2
DOUT 3
DOUT 4
DOUT 5
DOUT 6
P-Regulator/analogous output
P-Reg. setpoint: 0,234375l/min (7,813mV)
REG1
0:00:00
0:10:00
0:15:00
0:40:00
1:00:00

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Inter comparison Soil gas measurement Beijing 28.03.2010

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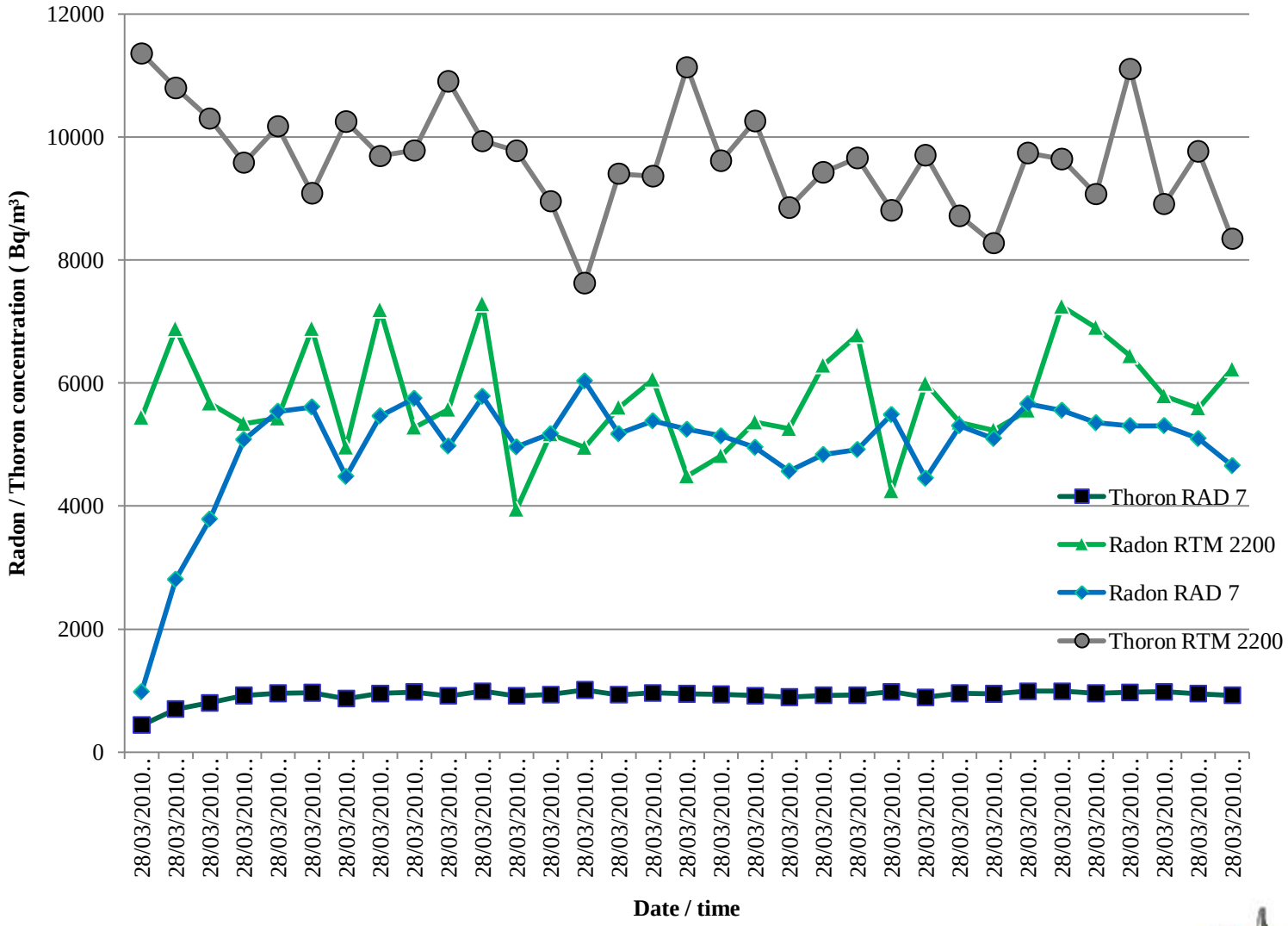
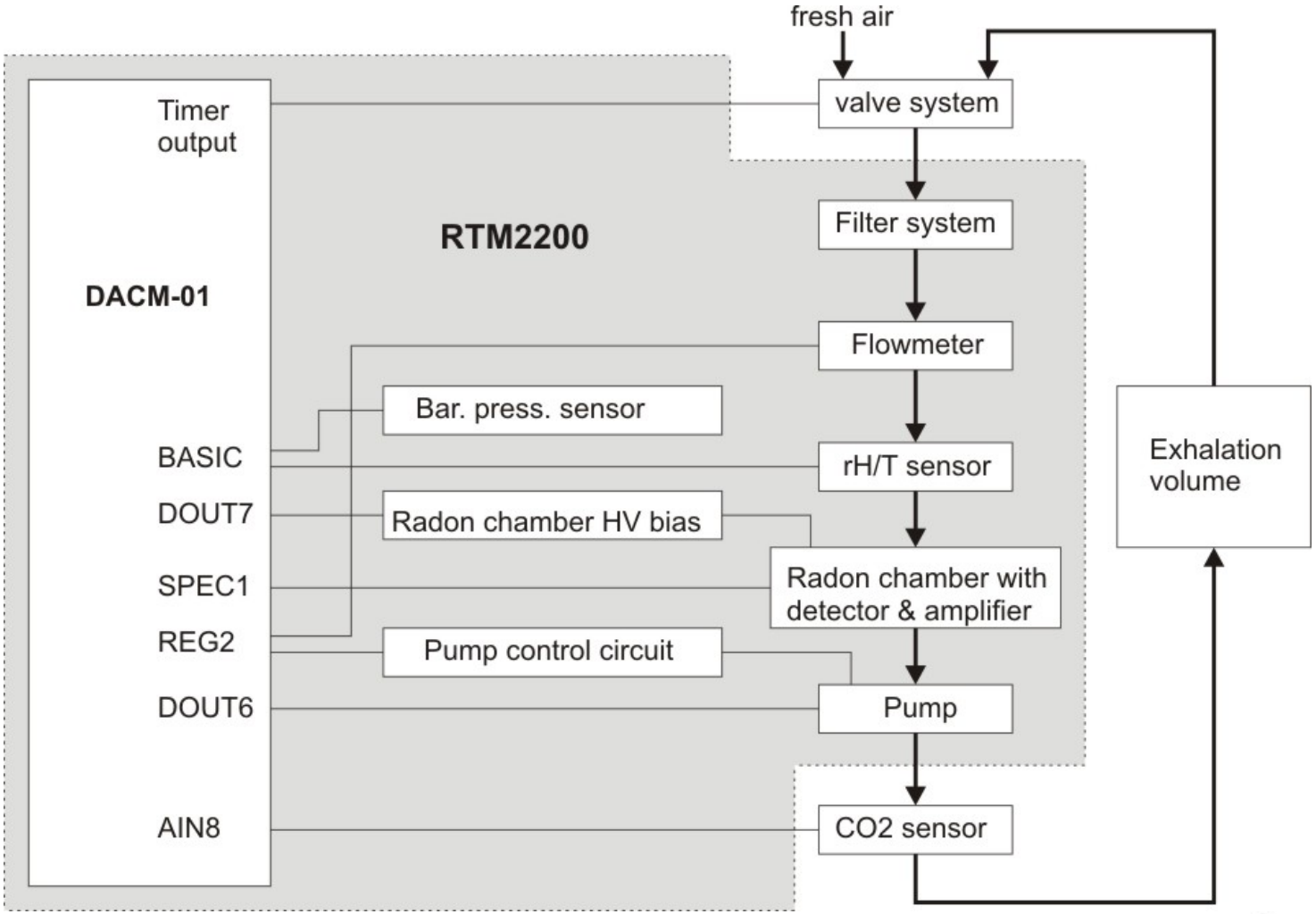
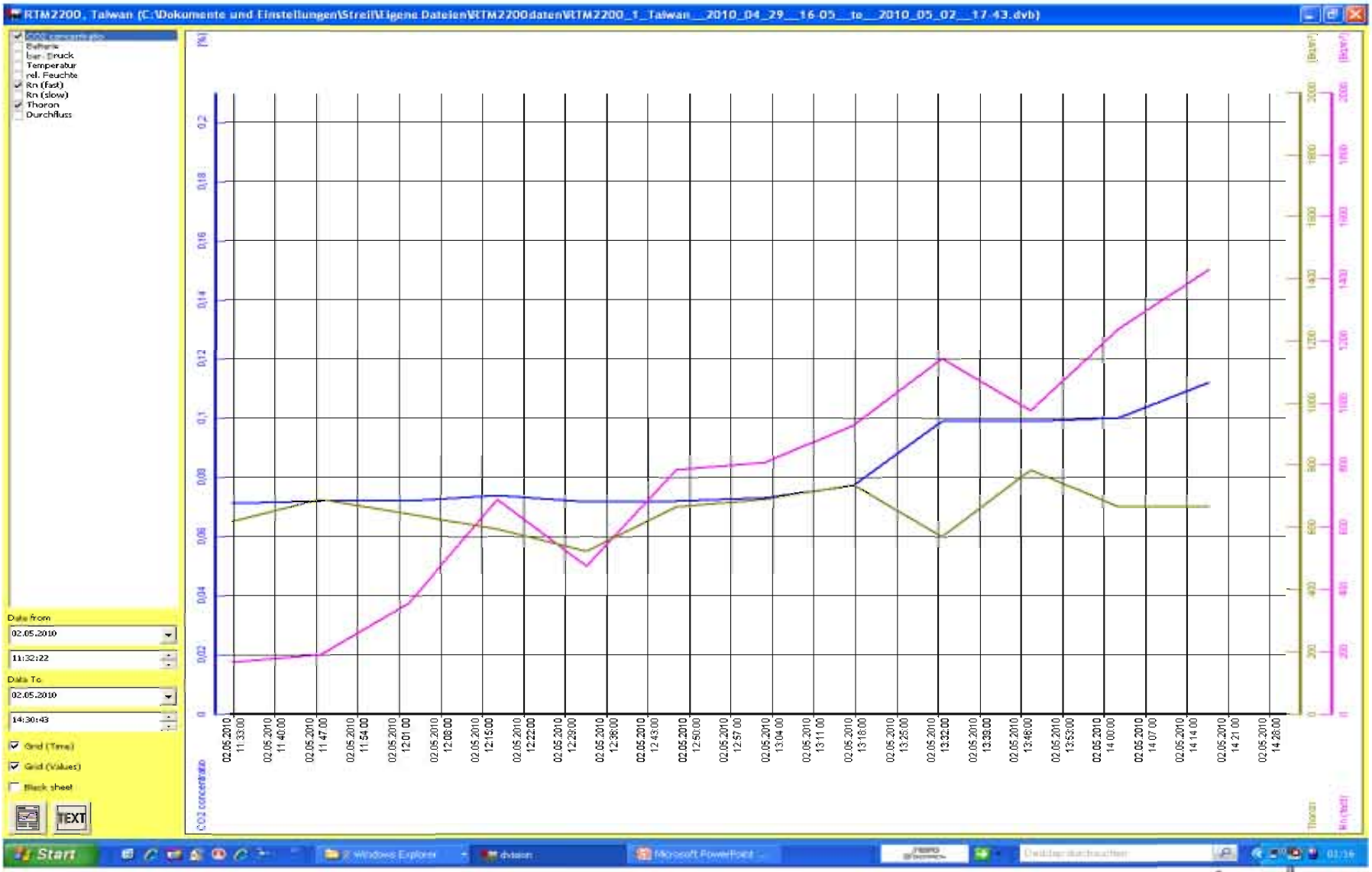
Inter comparison Soil gas measurement Beijing 28.03.2010



Soil gas flux extension with RTM2200




RTM2200, Taiwan (C:\Dokumente und Einstellungen\Streil\Eigene Dateien\RTM2200daten\RTM2200_1_Taiwan__2010_04_29__16-05__to__2010_05_02__17-43.dvb)
CO2 concentration
Batterie
Luftdruck
Temperatur
rel. Feuchte
Rn (fast)
Rn (slow)
Thoron
Durchfluss
Data from
02.05.2010
11:32:22
Data To
02.05.2010
14:30:43
Grid (Time)
Grid (Values)
Black sheet
TEXT
CO2 concentration
Thoron
Rn (fast)
Start

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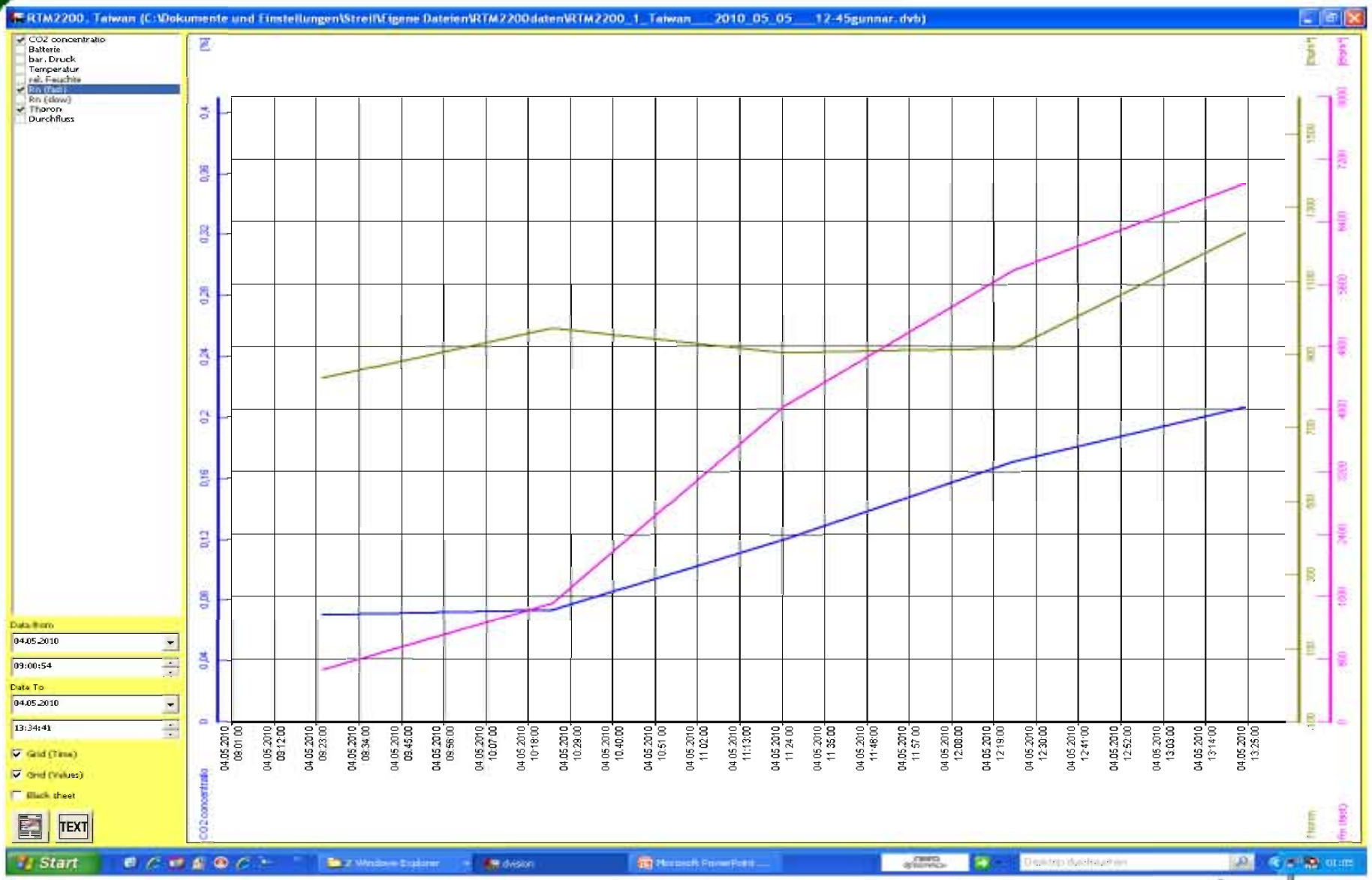
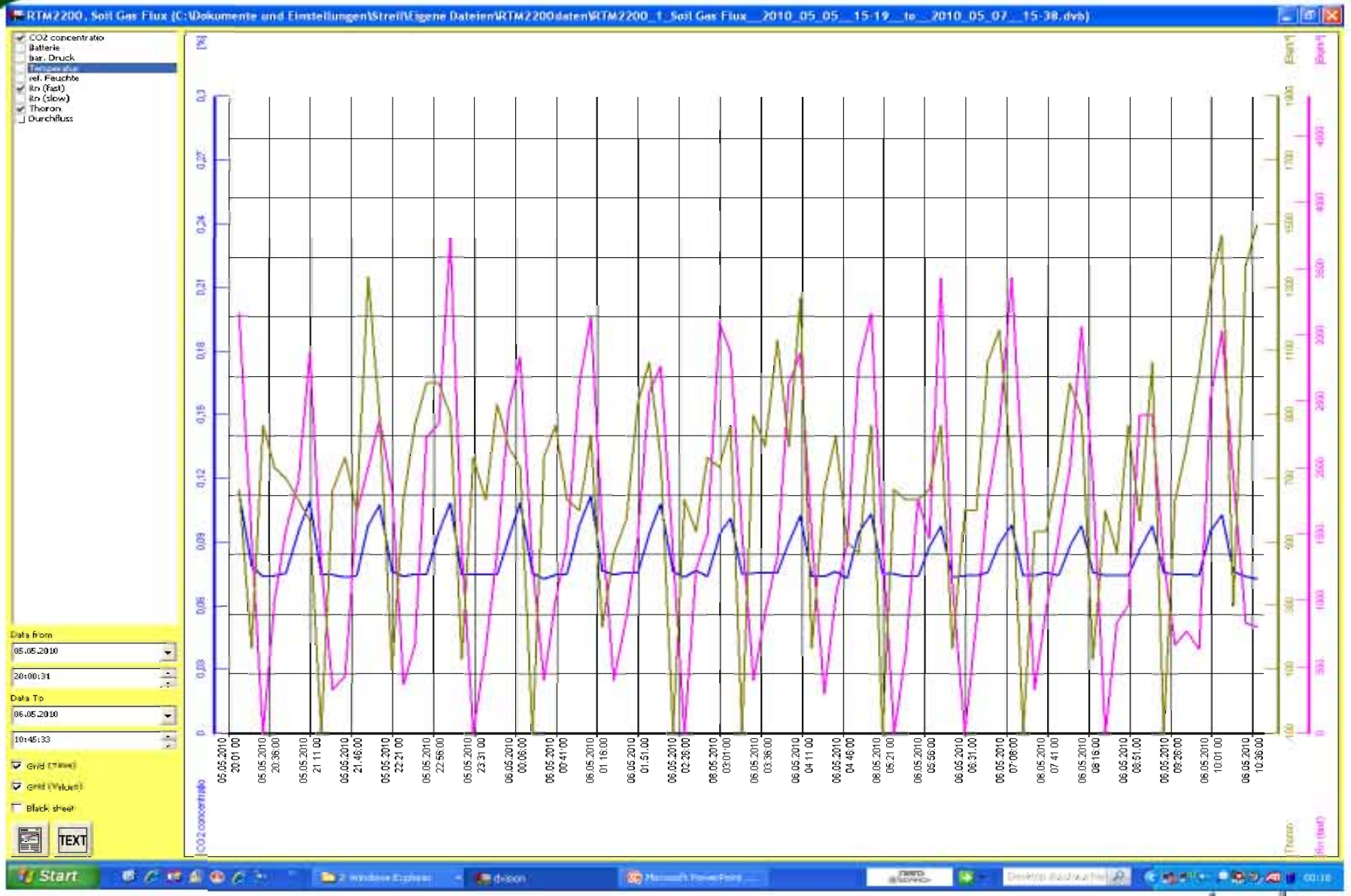

RTM2200, Taiwan (C:\Dokumente und Einstellungen\Streit\Eigene Dateien\RTM2200daten\RTM2200_1_Taiwan___2010_05_05___12-45gunnar.dvb)
CO2 concentratio
Batterie
bar, Druck
Temperatur
rel. Feuchte
Rn (fast)
Rn (slow)
Thoron
Durchfluss
Data from
04.05.2010
09:00:54
Data To
04.05.2010
13:34:41
Grid (Time)
Grid (Values)
Black sheet
TEXT
[%]
CO2 concentratio
Start


RTM2200, Soil Gas Flux (C:\Dokumente und Einstellungen\Streit\Eigene Dateien\RTM2200daten\RTM2200_1_Soil Gas Flux__2010_05_05__15-19__to__2010_05_07__15-38.dvb)
CO2 concentratio
Batterie
bar. Druck
Temperatur
rel. Feuchte
Rn (fast)
Rn (slow)
Thoron
Durchfluss
Data from
05.05.2010
20:00:31
Data To
06.05.2010
10:45:33
Grid (Time)
Grid (Value)
Black sheet
TEXT
[%]
CO2 concentratio
[Bq/m³]
[Bq/m³]
(Thoron)
(Rn fast)
05.05.2010 20:01:00
05.05.2010 20:36:00
05.05.2010 21:11:00
05.05.2010 21:46:00
05.05.2010 22:21:00
05.05.2010 22:56:00
05.05.2010 23:31:00
06.05.2010 00:06:00
06.05.2010 00:41:00
06.05.2010 01:16:00
06.05.2010 01:51:00
06.05.2010 02:26:00
06.05.2010 03:01:00
06.05.2010 03:36:00
06.05.2010 04:11:00
06.05.2010 04:46:00
06.05.2010 05:21:00
06.05.2010 05:56:00
06.05.2010 06:31:00
06.05.2010 07:06:00
06.05.2010 07:41:00
06.05.2010 08:16:00
06.05.2010 08:51:00
06.05.2010 09:26:00
06.05.2010 10:01:00
06.05.2010 10:36:00
Start

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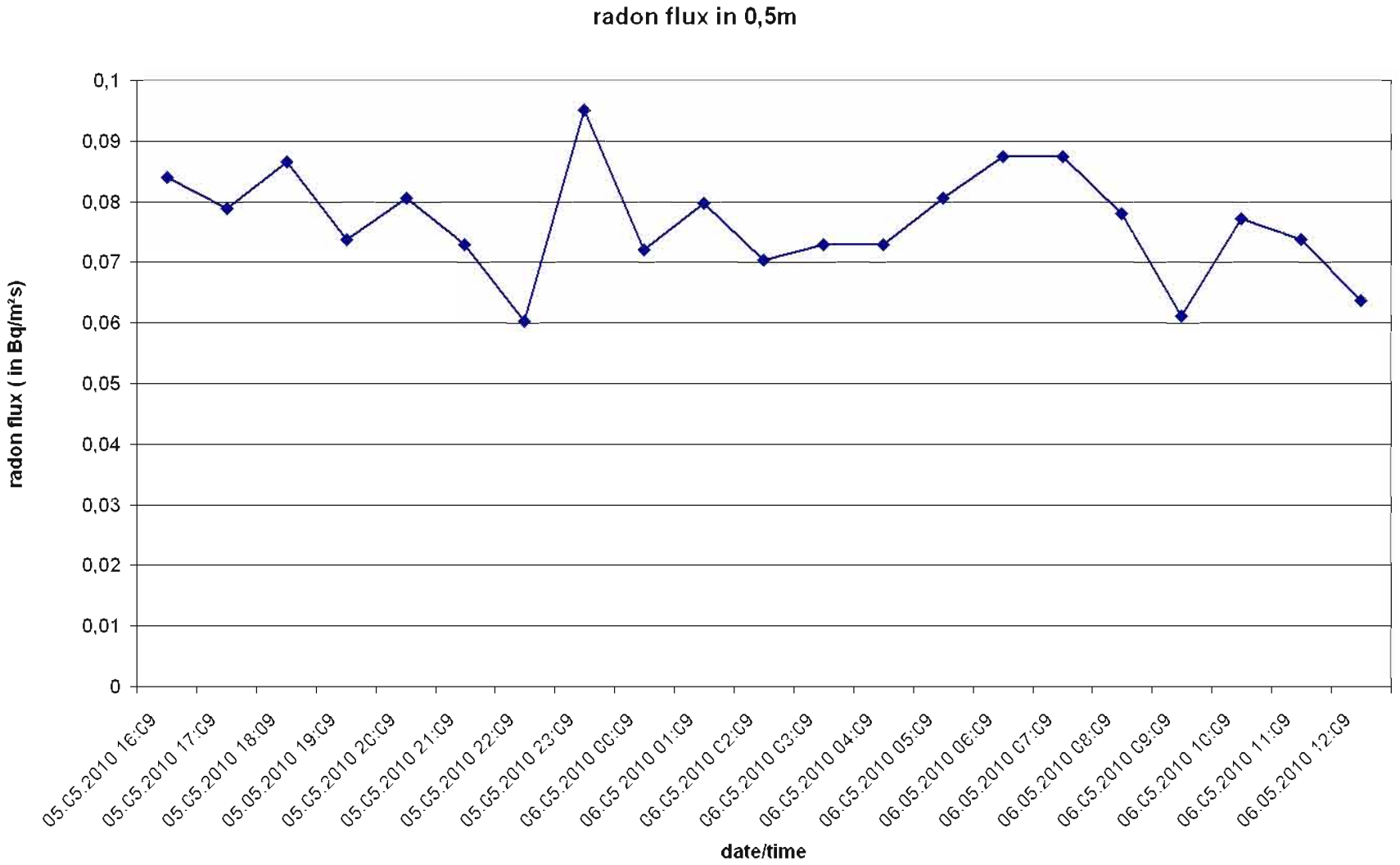
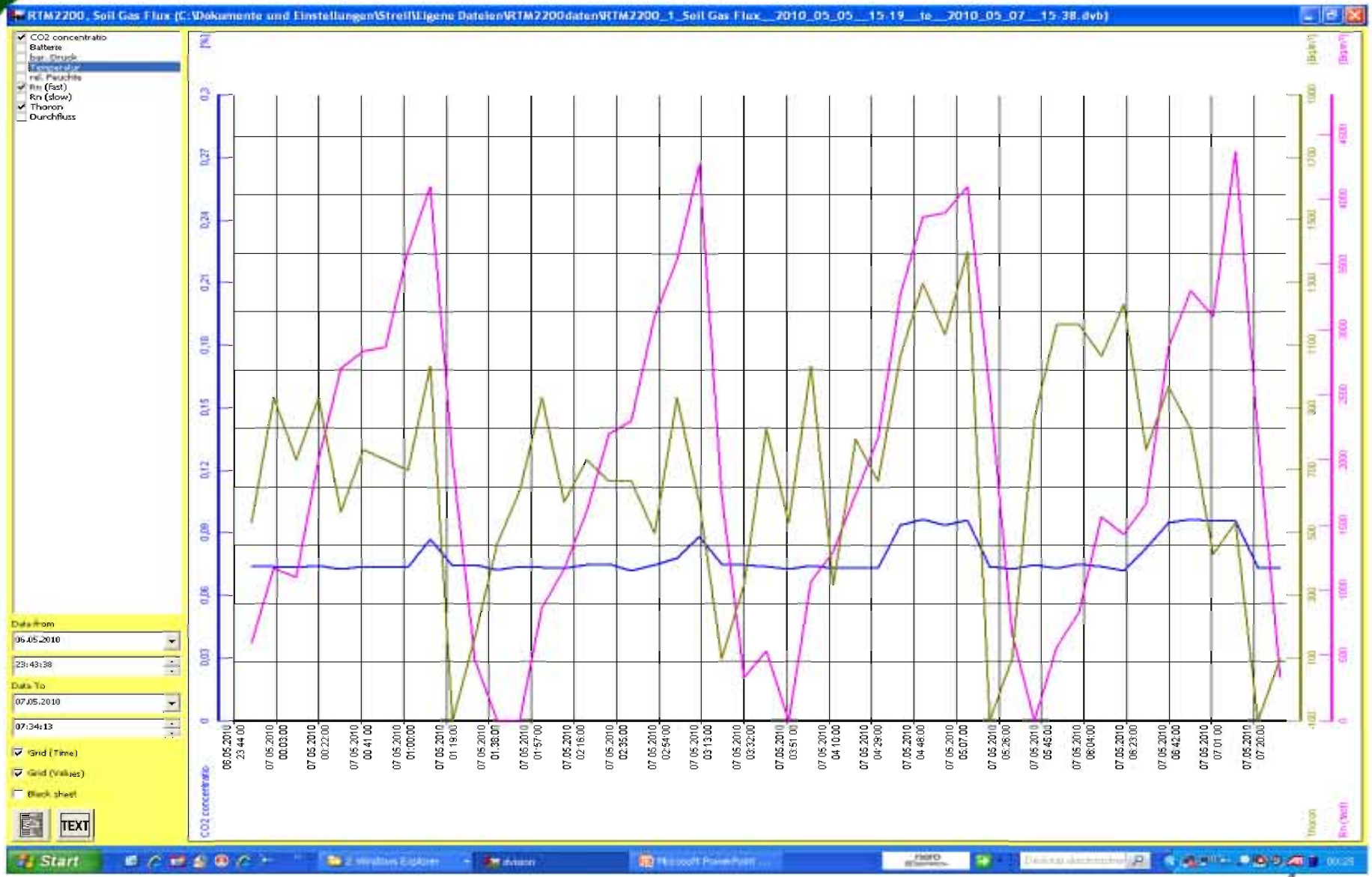
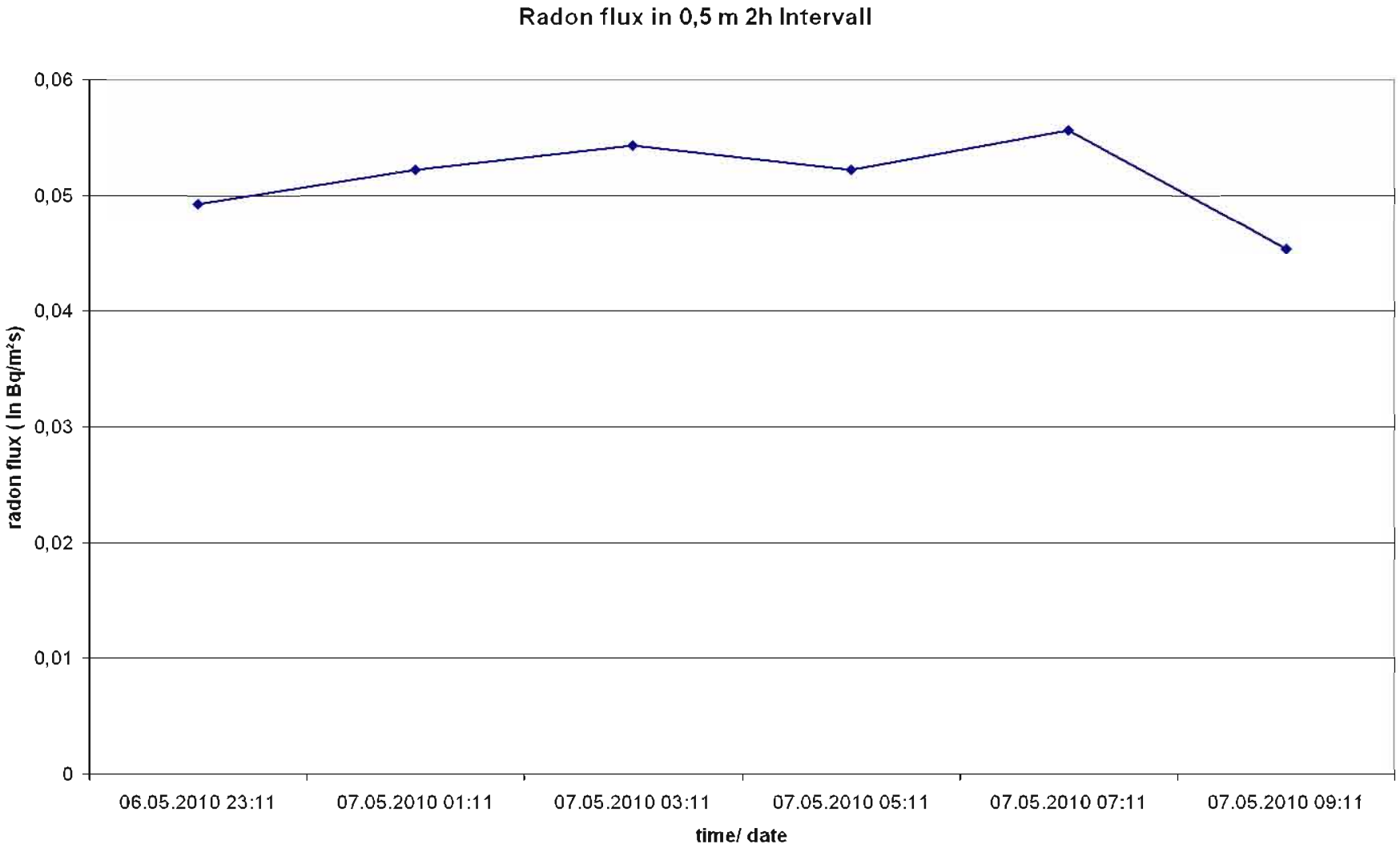
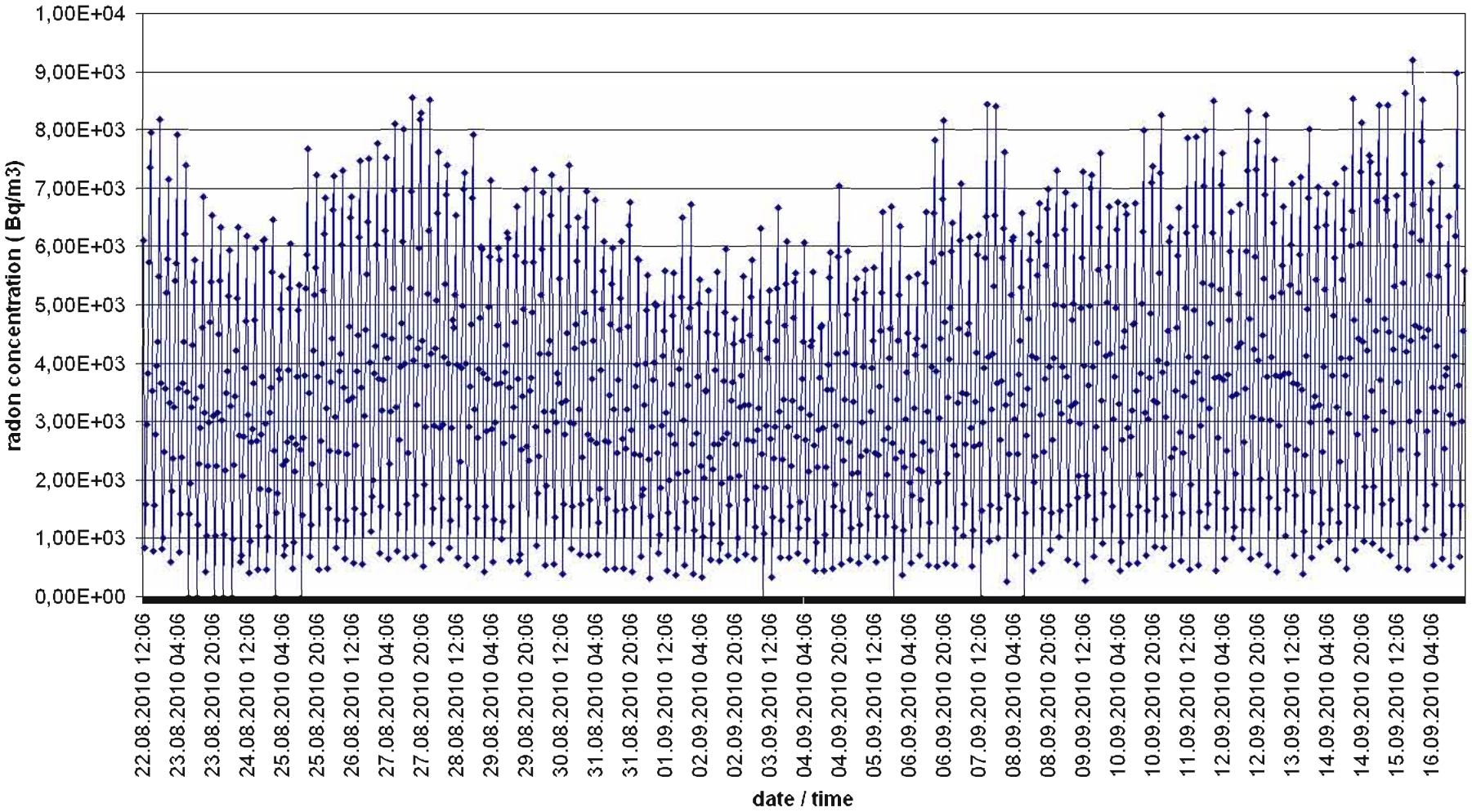
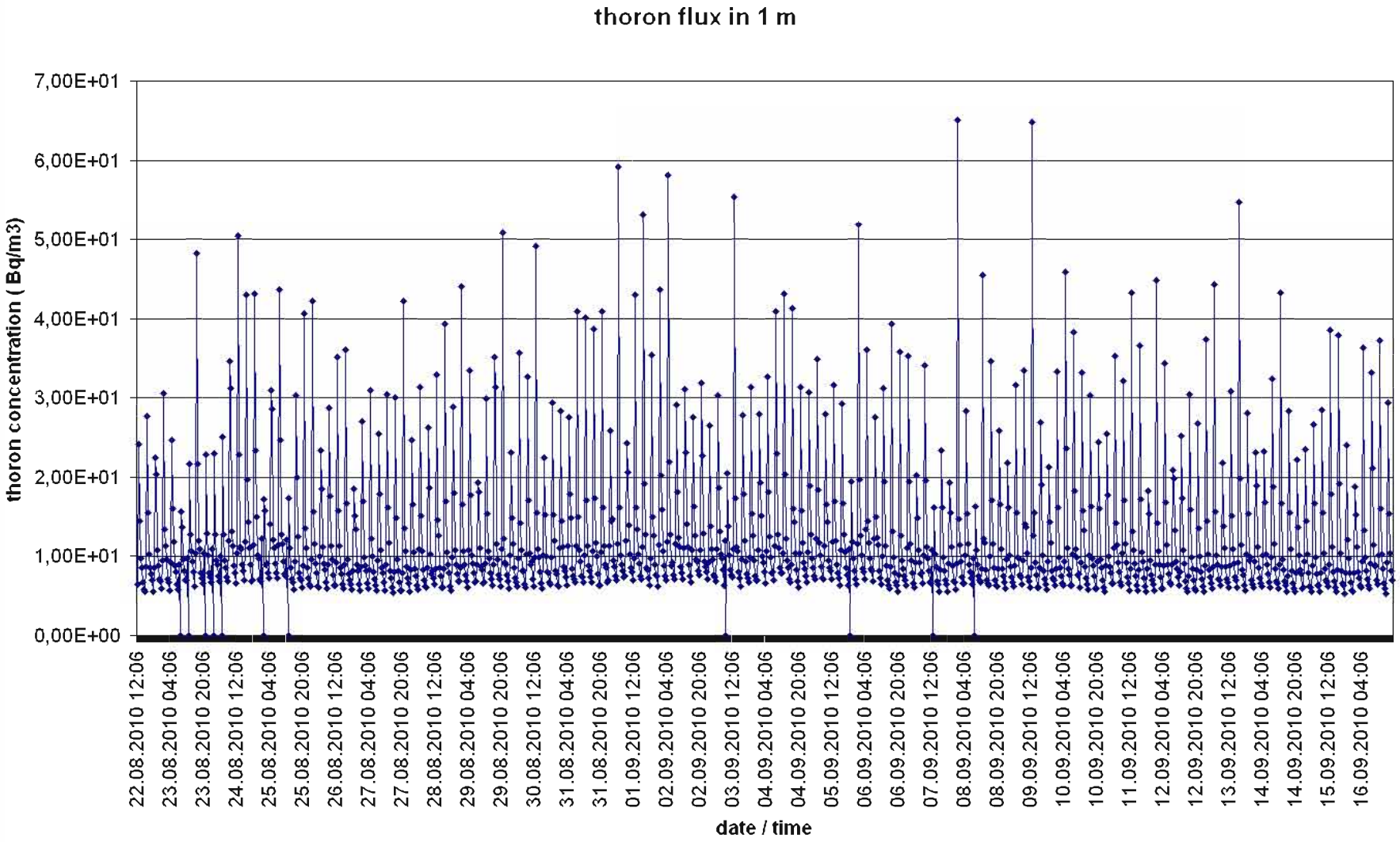

radon flux in 0,5m
radon flux (in Bq/m²s)
0,1
0,09
0,08
0,07
0,06
0,05
0,04
0,03
0,02
0,01
0
05.05.2010 16:09
05.05.2010 17:09
05.05.2010 18:09
05.05.2010 19:09
05.05.2010 20:09
05.05.2010 21:09
05.05.2010 22:09
05.05.2010 23:09
06.05.2010 00:09
06.05.2010 01:09
06.05.2010 02:09
06.05.2010 03:09
06.05.2010 04:09
06.05.2010 05:09
06.05.2010 06:09
06.05.2010 07:09
06.05.2010 08:09
06.05.2010 09:09
06.05.2010 10:09
06.05.2010 11:09
06.05.2010 12:09
date/time

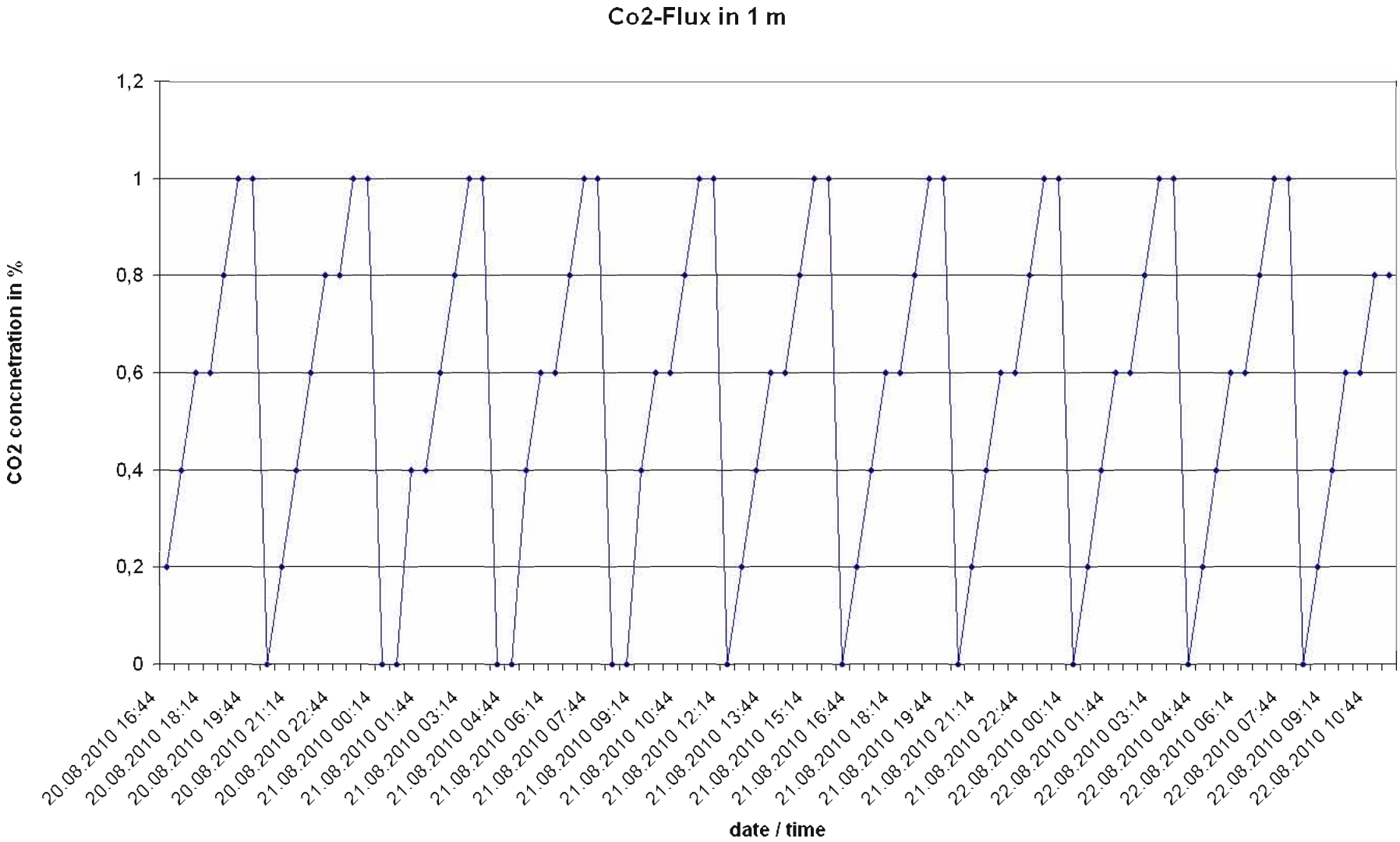

RTM2200, Soil Gas Flux (C:\Dokumente und Einstellungen\Streit\Eigene Dateien\RTM2200daten\RTM2200_1_Soil Gas Flux__2010_05_05__15:19__to__2010_05_07__15:38.dvb)
CO2 concentratio
Batterie
Int. Druck
Temperatur
rel. Feuchte
Rn (fast)
Rn (slow)
Thoron
Durchfluss
Data From
06.05.2010
23:43:38
Data To
07.05.2010
07:34:13
Grid (Time)
Grid (Values)
Black sheet
TEXT
[%]
CO2 concentratio
Thoron
Rn (fast)
06.05.2010 23:44:00
07.05.2010 00:03:00
07.05.2010 00:22:00
07.05.2010 00:41:00
07.05.2010 01:00:00
07.05.2010 01:19:00
07.05.2010 01:38:00
07.05.2010 01:57:00
07.05.2010 02:16:00
07.05.2010 02:35:00
07.05.2010 02:54:00
07.05.2010 03:13:00
07.05.2010 03:32:00
07.05.2010 03:51:00
07.05.2010 04:10:00
07.05.2010 04:29:00
07.05.2010 04:48:00
07.05.2010 05:07:00
07.05.2010 05:26:00
07.05.2010 05:45:00
07.05.2010 06:04:00
07.05.2010 06:23:00
07.05.2010 06:42:00
07.05.2010 07:01:00
07.05.2010 07:20:00
Start


Radon flux in 0,5 m 2h Intervall
0,06
0,05
0,04
0,03
0,02
0,01
0
radon flux (In Bq/m²s)
06.05.2010 23:11
07.05.2010 01:11
07.05.2010 03:11
07.05.2010 05:11
07.05.2010 07:11
07.05.2010 09:11
time/ date

Radon flux in 1 m




thoron flux in 1 m
thoron concentration (Bq/m3)
7,00E+01
6,00E+01
5,00E+01
4,00E+01
3,00E+01
2,00E+01
1,00E+01
0,00E+00
22.08.2010 12:06
23.08.2010 04:06
23.08.2010 20:06
24.08.2010 12:06
25.08.2010 04:06
25.08.2010 20:06
26.08.2010 12:06
27.08.2010 04:06
27.08.2010 20:06
28.08.2010 12:06
29.08.2010 04:06
29.08.2010 20:06
30.08.2010 12:06
31.08.2010 04:06
31.08.2010 20:06
01.09.2010 12:06
02.09.2010 04:06
02.09.2010 20:06
03.09.2010 12:06
04.09.2010 04:06
04.09.2010 20:06
05.09.2010 12:06
06.09.2010 04:06
06.09.2010 20:06
07.09.2010 12:06
08.09.2010 04:06
08.09.2010 20:06
09.09.2010 12:06
10.09.2010 04:06
10.09.2010 20:06
11.09.2010 12:06
12.09.2010 04:06
12.09.2010 20:06
13.09.2010 12:06
14.09.2010 04:06
14.09.2010 20:06
15.09.2010 12:06
16.09.2010 04:06
date / time


Co2-Flux in 1 m
CO2 concnetration in %
1,2
1
0,8
0,6
0,4
0,2
0
20.08.2010 16:44
20.08.2010 18:14
20.08.2010 19:44
20.08.2010 21:14
20.08.2010 22:44
21.08.2010 00:14
21.08.2010 01:44
21.08.2010 03:14
21.08.2010 04:44
21.08.2010 06:14
21.08.2010 07:44
21.08.2010 09:14
21.08.2010 10:44
21.08.2010 12:14
21.08.2010 13:44
21.08.2010 15:14
21.08.2010 16:44
21.08.2010 18:14
21.08.2010 19:44
21.08.2010 21:14
21.08.2010 22:44
22.08.2010 00:14
22.08.2010 01:44
22.08.2010 03:14
22.08.2010 04:44
22.08.2010 06:14
22.08.2010 07:44
22.08.2010 09:14
22.08.2010 10:44
date / time

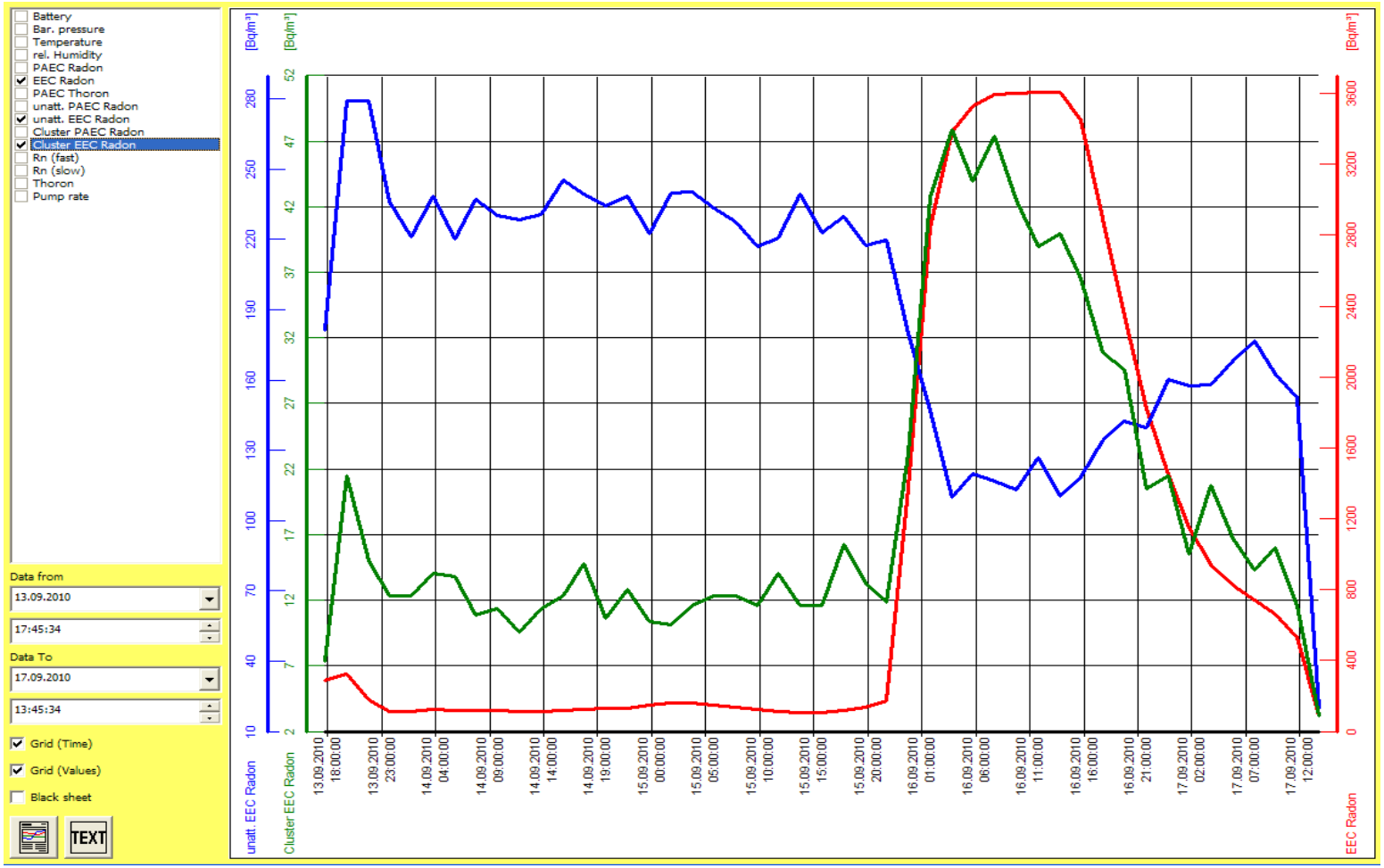
EQF3220 – Radon, Thoron and daughters

Continuous sampling through screen and filter

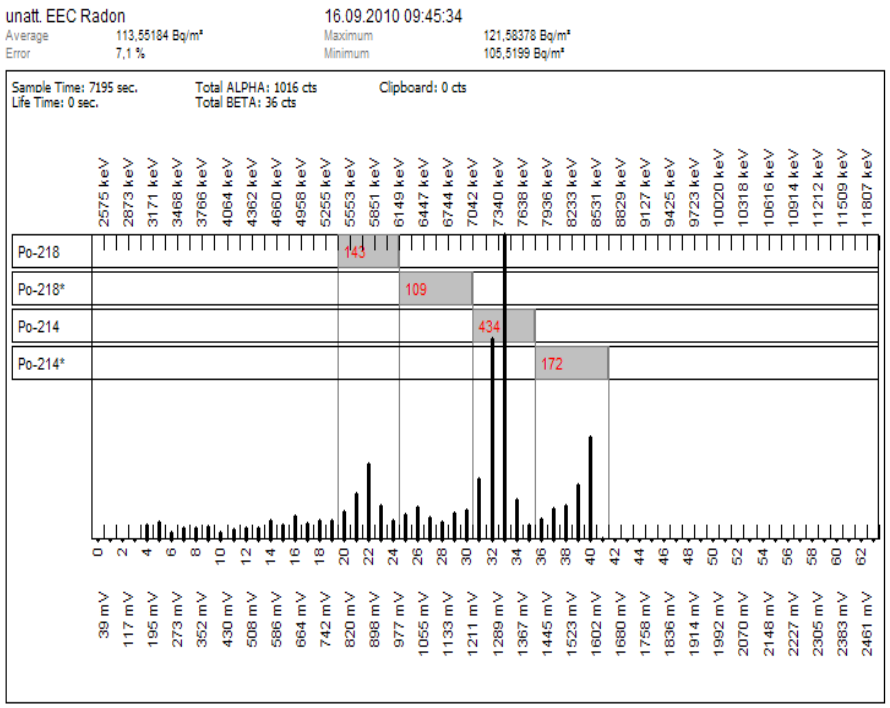
Removeable sampling head for free positioning inside a room

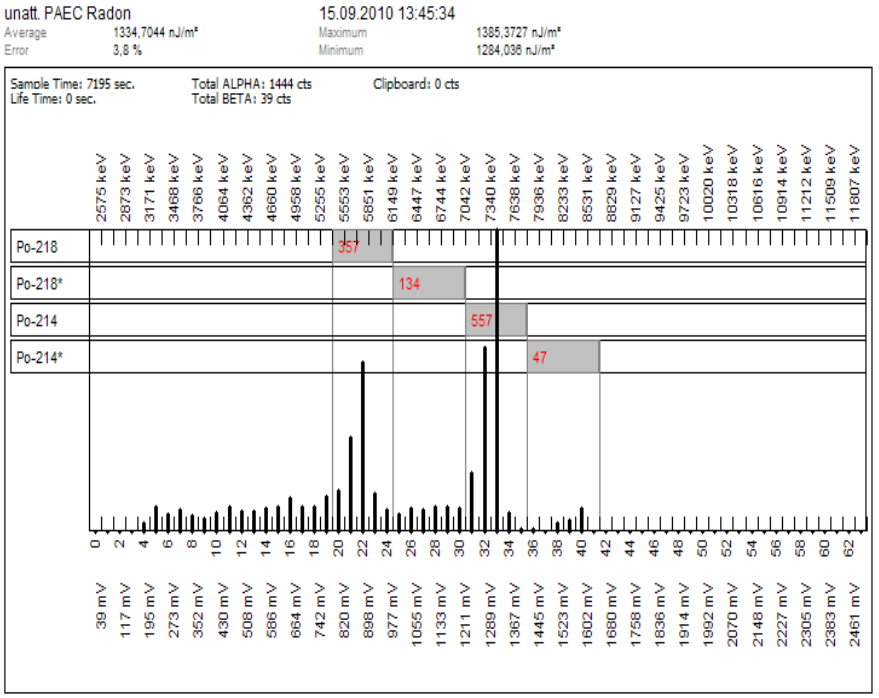
Three particle size fractions
- unattached

Quality asurance of the measurement



Screen spectra (unattached daughters)

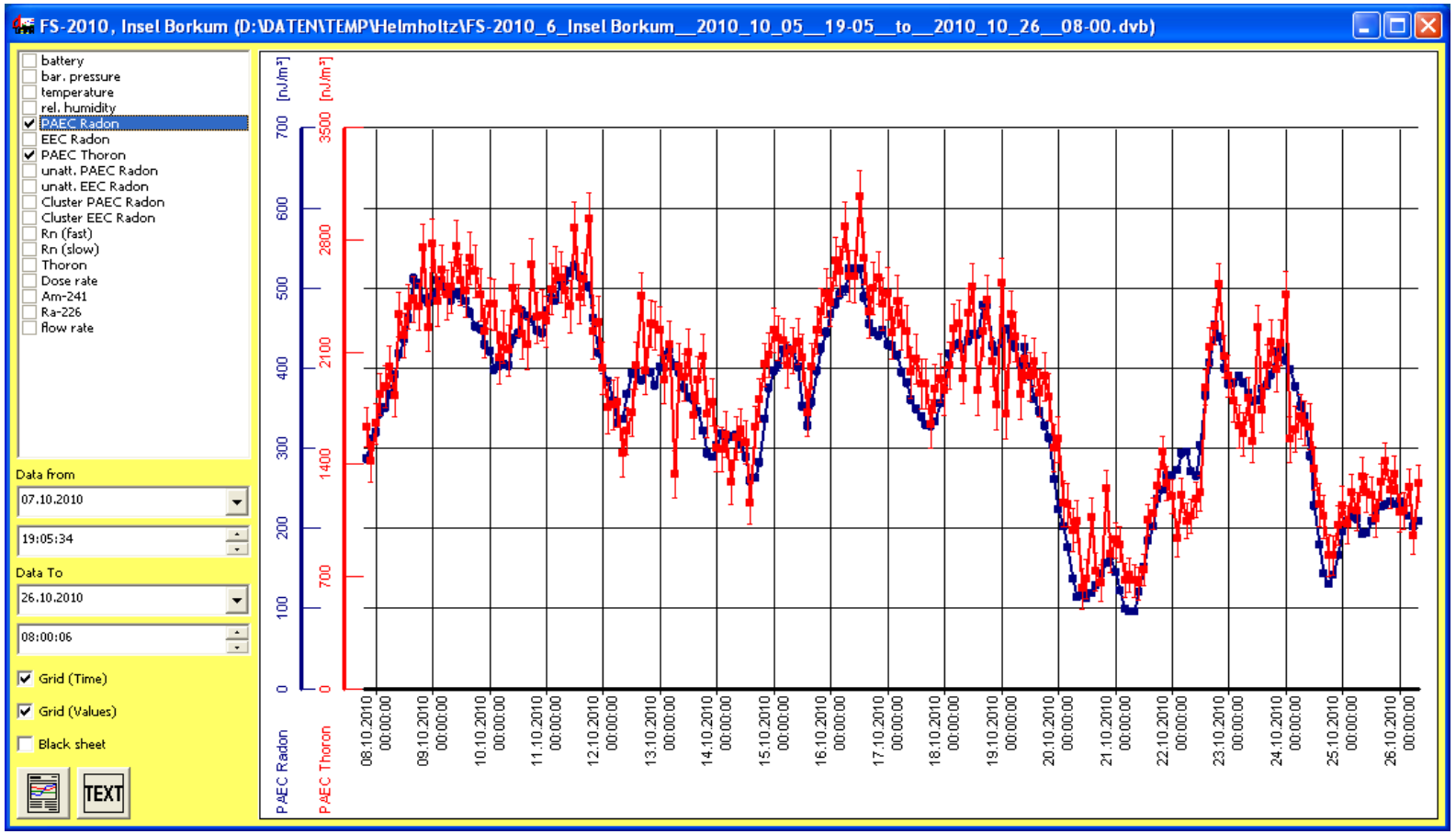




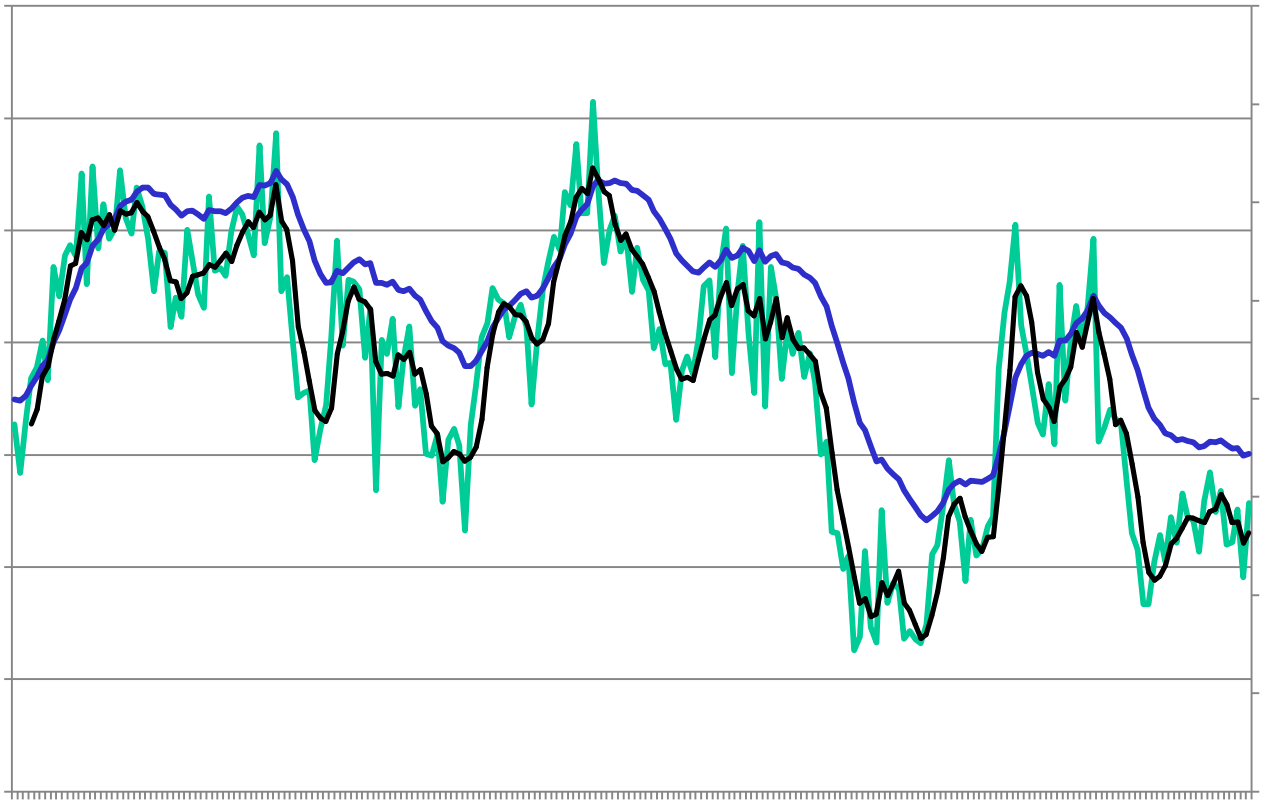
Cluster (during burning processes)

„Normal“ particle size distribution

PAEC Radon & Thoron daughters



Thoron PAEC Time resolution



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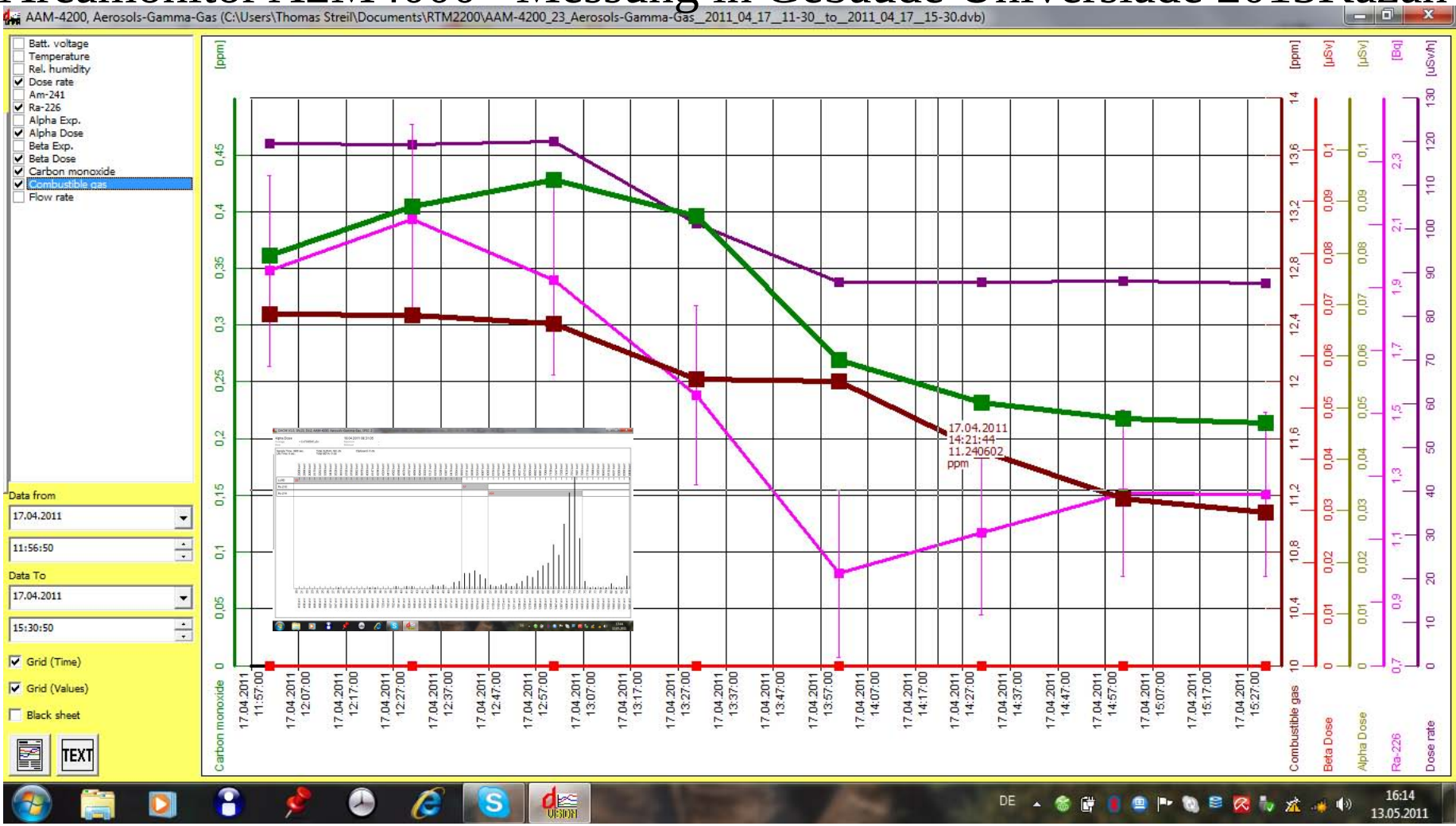

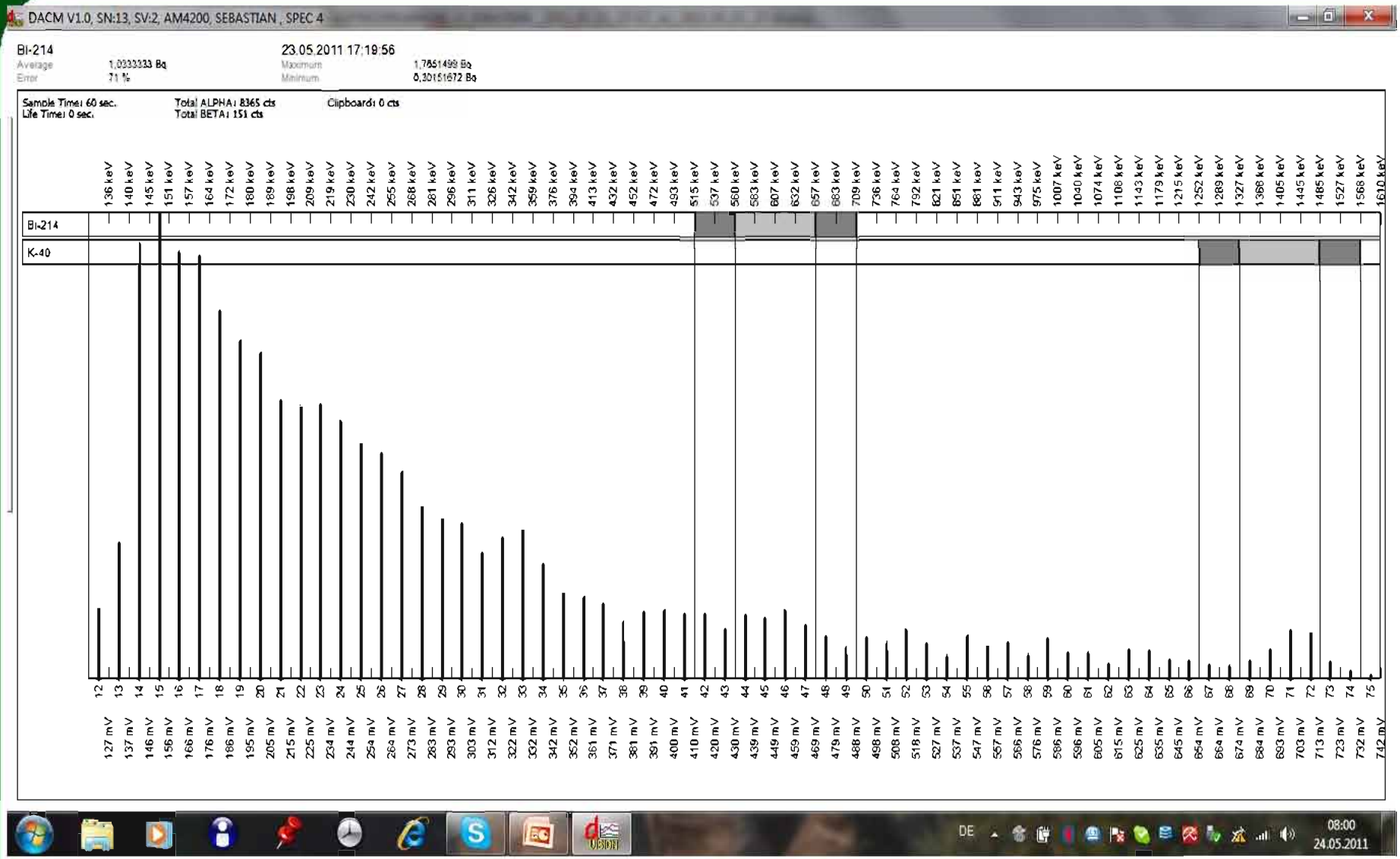
DACM V1.0, SN:13, SV:2, AM4200, SEBASTIAN , SPEC 4
Bi-214
Average 1,0333333 Bq
Error 71 %
23.05.2011 17:19:56
Maximum 1,7851498 Bq
Minimum 0,30151672 Bq
Sample Time: 60 sec.
Life Time: 0 sec.
Total ALPHA: 8365 cts
Total BETA: 151 cts
Clipboard: 0 cts
Bi-214
K-40
08:00
24.05.2011

“Hazard-Detection and Management”

7th Dresden Symposium
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