- my R42 -
geiger counter

Premium White Edition Hardware: V22.1 Firmware: V42.02

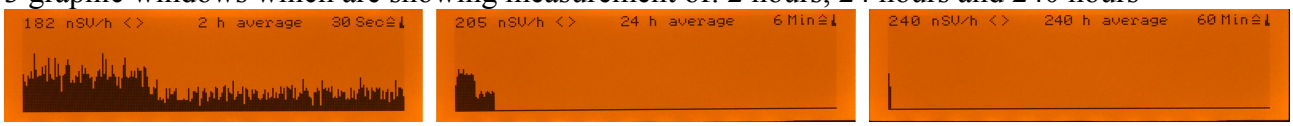
Calibrated and tested with Cs-137 - from 0,5 µSV/h to 1,2 mSV/h. Overload upto 50 mSv/h.

supply voltage: 3.9 .. 14.2 V DC

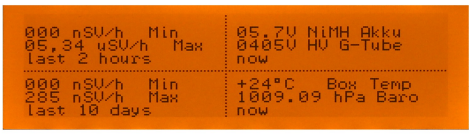
supply current: 1.6 .. 2.4 mA without LED backlight

high voltage for any geiger tube: 250 .. 700 V infinitely variable via software controlled by PWM

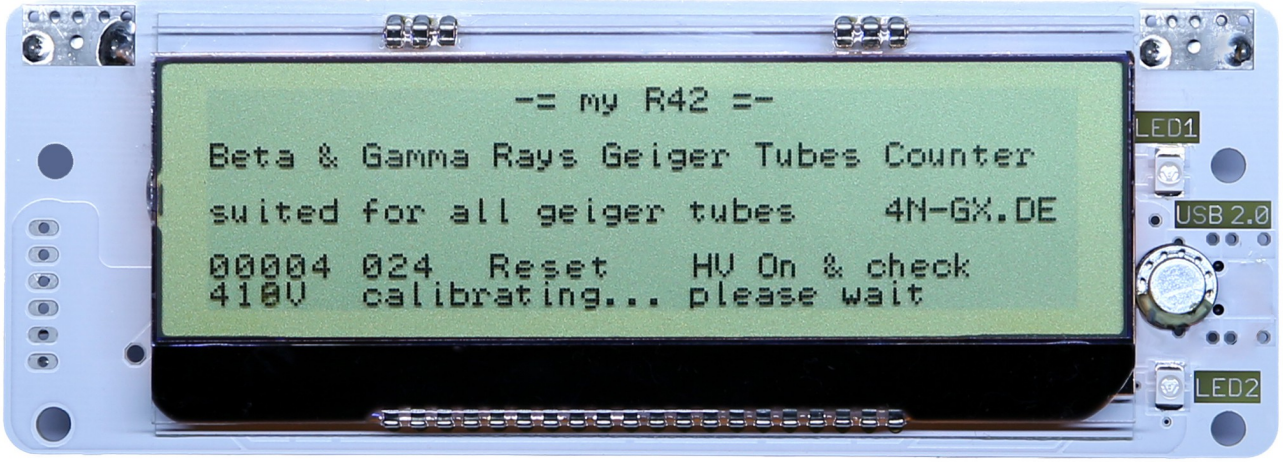
3 graphic windows which are showing measurement of: 2 hours, 24 hours and 240 hours

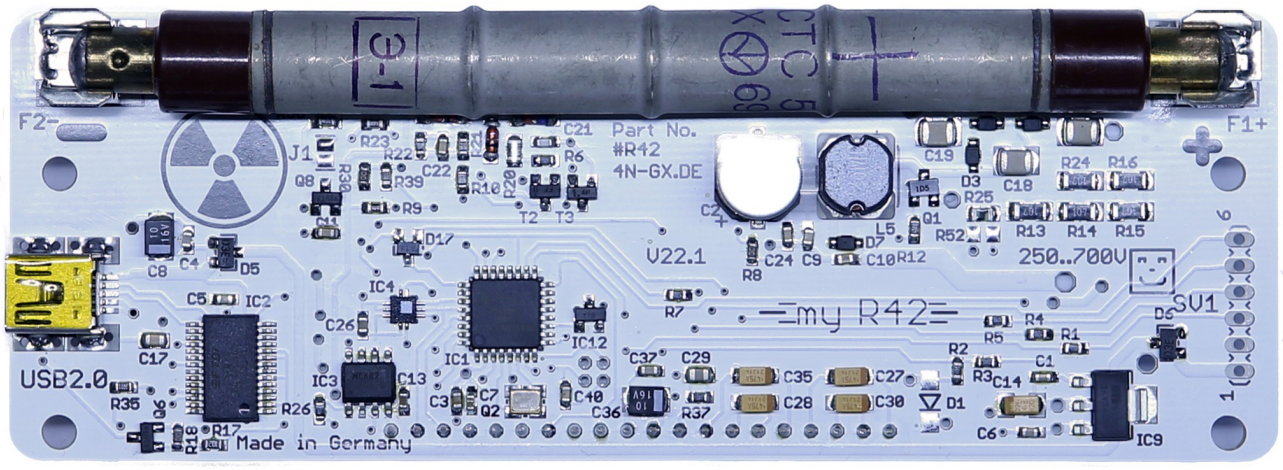


graphic with following information:
supply voltage, high voltage, temperature, barometric pressure, momentary measured radiation, max. measured radiation , min. measured radiation, counted impacts per 30 secounds



USB2.0 and RS232 TTL 3.3V interfaces for setups, download measured values and live data streaming... and more... extrem flexible.





My R42 doc **page**

General instructions & notices

my R42 – is the third modification/decoupling of the original - #R10 4N-GX Autonomous, solar powered station for environmental radioactivity 433.92 MHz radio or cable connection to the evaluator - developed and designed by 4N-GALAXY. http://www.4n-gx.de/R10_de.html

Special feature: Average Power Consumption 1,9 mA

ATTENTION!

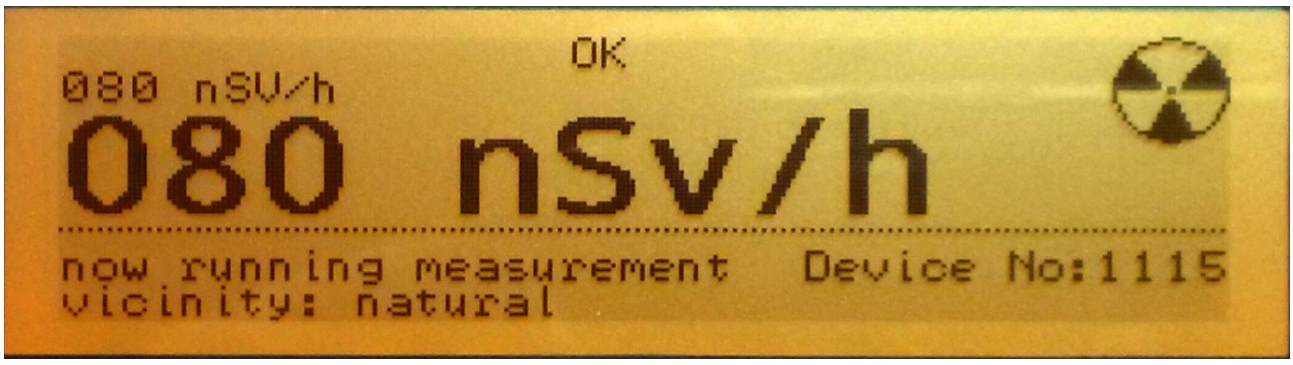
Do not touch the high-voltage part.
Keep the board clean and dry.
Pay attention to the LCD glass, particularly at the corners.
Use only DC voltage of 3.9 to 14.2Volt as power supply.
Do not operate in direct sunlight – it can influence the measurement results because of overheating.

WARNING!

When powered up, this board produces a high voltage of 250 to 700 Volt.
If you buy this kit you are fully responsible for any possible injury caused .
during assembly or using of this device. Never touch the board during operation.
Before powering on, place the finished kit into a plastic case to prevent touching
high voltage elements .

GUARANTEE

24 months from date of purchase.



Thank you for your trust and purchase!

Now have fun with R42 4N-GX team

ask, help, feedback: mailto:RRM@4N-GALAXY.DE?subject=#R42

SetUp Menu

Small and capital letters can be used for commands. “e” and “E” have the same effect.
You can use any terminal program for the communication with R42. (115.2 Kbaud 8 N 1)

Call SetUp menu - Send any character to R42 board.
The setup menu can always be activated / called. For this purpose, send any character via USB COM Port or RS232 to my R42 board.

While the setup menu is running the normal work loop is interrupted.
Setup can be completed with: Exit command, reset command or automatically over timeout if no user activity is done for 2 minutes. After exit setup menu R42 is running in regular work loop.

You can change the parameters over SetUp menu. (alarm, back light, coversion, tube voltage)
You can read logs over SetUp menu. (last 2 hours, last 24 hours, last 240 hours)
You can read live values over SetUp menu. (temp., bar. pressure, supply voltage, tube voltage)

You can make remote measurements over SetUp menu.
(any measurement time, any conversion factor, any geiger tube high voltage)

Exit

Send character “E” to the R42 board. Exit command ends the setup menu and saves all parameter values to EEprom (alarm value, led on/off, conversion value, tube voltage).

Reset

Send character “R” to the R42 board. Reset command erase all logs and restart the R42 board.

Clear all logs

Send character “C” to the R42 board. Clear command erase all logs.

LED on/off background

Send string “L0” to R42 board to turn off the LCD LED backlight.
Send string “L1” to R42 board to turn on the LCD LED backlight.

This setting is stored in EEprom.

Alarm value

Send string “A0010” ... “A9999” to the R42 board. Set the alarm value.

Examples:
A0200 causes a 2 sec. alarm sound if the measurement value is over 200 ip/30 sec. > 2,28 µSV/h
A0038 causes a 2 sec. alarm sound if the measurement value is over 38 ip/30 sec. > 343 nSV/h

This setting is stored in Eeprom.

View all measured values loop

Send character “V” to the R42 board. View command gives you back all measured values.
Loop – every second, 2 outputs (2 text lines)
Abort/End with “E”

Example:

View - Values Loop - Stop/Exit with E - Done
00008 04.7V 401V +28°C 1003.68hPa
00008 04.7V 401V +28°C 1003.69hPa
00008 04.7V 404V +28°C 1003.71hPa

Sound on/off control

Send string “Z0” to R42 board to turn off the sound.
Send string “Z1” to R42 board to turn on the sound.

Z0 - Silent operation mode. No signal or alarm tone.
Z1 – Normal operation mode. Alarm and signal tone are on.

This setting is stored in EEprom.

Read EEprom values

Send character “X” to the R42 board. Now you can see all EEprom values.

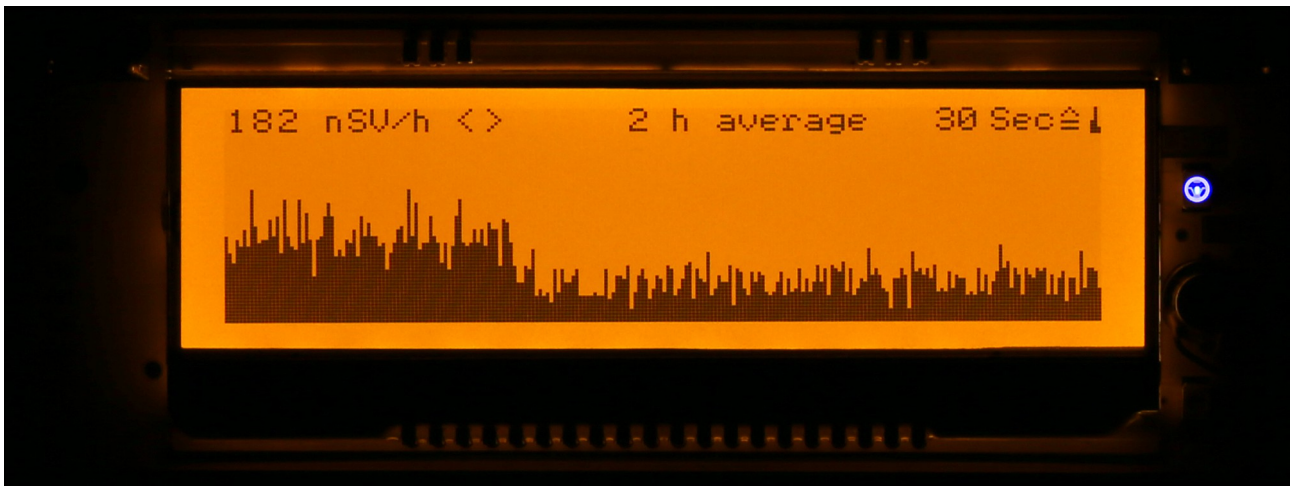
```
Alarm value...........:  0060
Conversion factor.....:  0875
LED control...........:     1
Tube voltage..........:  0400
Pressure Offset.......: 15000
Temperature Offset....: 00012
ip Correction control.:     0
Sound control.........:     1
Loop screen time......:     0
```

Hours log read last 2 hours

Send character “H” to the R42 board. Hours command gives you back last 240 measured values.
1 measurement per 30 secound * 240 = last 2 hours

Example:

Read - 2 h Log - Done
00006,00005,00007,00007,00003,00007,00010,00009,00008,00009,00005,00013,00010,00002,000
08,00006,00004,00007,00008,00011,00009,00006,00008,00007,00006,00010,00008,00009,00008,
00006,00007,00008,00004,00007,00002,00005,00012,00006,00012,00007,00007,00006,00009,000
04,00008,00009,00007,00002,00008,00015,00010,00009,00005,00008,00011,00009,00004,00007,
00007,00008,00006,00008,00008,00012,00005,00007,00011,00012,00011,00006,00007,00011,000
12,00006,00005,00005,00009,00005,00009,00007,00004,00007,00014,00004,00010,00006,00006,
00006,00003,00009,00007,00010,00009,00014,00008,00009,00007,00007,00003,00006,00013,000
09,00005,00007,00004,00008,00007,00006,00012,00008,00003,00004,00011,00001,00004,00009,
00015,00004,00003,00005,00005,00013,00010,00013,00006,00013,00007,00011,00006,00009,000
08,00009,00009,00005,00011,00006,00006,00007,00004,00008,00007,00007,00010,00008,00008,
00008,00002,00003,00007,00004,00006,00002,00004,00006,00015,00012,00010,00006,00008,000
10,00005,00006,00007,00007,00009,00009,00007,00004,00006,00005,00005,00006,00006,00008,
00008,00014,00015,00004,00007,00009,00011,00007,00009,00012,00007,00006,00014,00008,000
04,00010,00009,00007,00003,00007,00005,00007,00007,00006,00010,00013,00012,00009,00004,
00006,00001,00009,00008,00010,00008,00011,00007,00005,00010,00006,00010,00005,00009,000
02,00006,00007,00005,00009,00009,00006,00007,00007,00004,00008,00005,00005,00008,00009,
00005,00010,00013,00008,00008,00006,00007,00009



Day log read last 24 hours

Send character “H” to the R42 board. Hours command gives you back last 240 measured values.
1 measurement (average of 12 measurements) 12 * 30 sec. = 6 minutes
1 measurement 6 min. * 240 = last 24 hours

Example:

Read - 24 h Log - Done
00006,00007,00007,00006,00008,00008,00007,00007,00007,00007,00007,00009,00008,00008.....
… (same length like in the first example above the picture)

Week log read last 10 days

Send character “W” to the R42 board. Hours command gives you back last 240 measured values.
1 measurement (average of 120 measurements) 120 * 30 sec. = 60 minutes
1 measurement 60 min. * 240 = last 240 hours

Example:

Read - 240 h Log - Done
00007,00007,00007,00007,00007,00007,00007,00007,00007,00007,00007,00007,00007,00007,00008,00007,00007,00007,00007.....
… (same length like in the first example above the picture)

Start measurement

Send string “S0001” .. “S3600” to the R42 board. Start command gives you back ip/your time value
Loop – every measurement, 1 output (1 text line)
Abort/End with “E”

Examples:

S0020 causes measurements with a duration of 2 seconds
S3600 causes measurements with a duration of 3600 secounds (60 minutes)
S0060 causes measurements with a duration of 60 seconds

Start - Measuring Counts Loop - Stop/Exit with E - Done
00007,00011,00014,00022,00252,

(00252 means 252 impulses counted in 60 seconds)

Conversion factor

Send string “F0100” ... “F8000” to the R42 board. Set the conversion factor value.

Examples:

F0875 set the conversion factor to 87.5 (default value for SBM-20)
F0100 set the conversion factor to 10.0

This setting is stored in Eeprom.

For SBM-20 geiger tube can be applied:

$$\text{Radiation } \mu SV/h = \frac{\text{ip / 30 secounds}}{87{,}5}$$

20 counts (ip – impulse) per 30 secounds result in: $\frac{20}{87{,}5} = 0.228\ \mu SV/h$ (228 nSV/h)

SBM-20 need high voltage of 400 V for working nice

This formula works with the board correctly +/- 0,2% by 75 µSV/h (ca. 600 x the normal radiation)

If you want to use other geiger tubes then you need to change the conversions factor and the high voltage for the tube!

In work loop the measuring time is ALWAYS 30 seconds. If you need other measuring time then you can use the **Start** command.

Tube voltage high voltage value

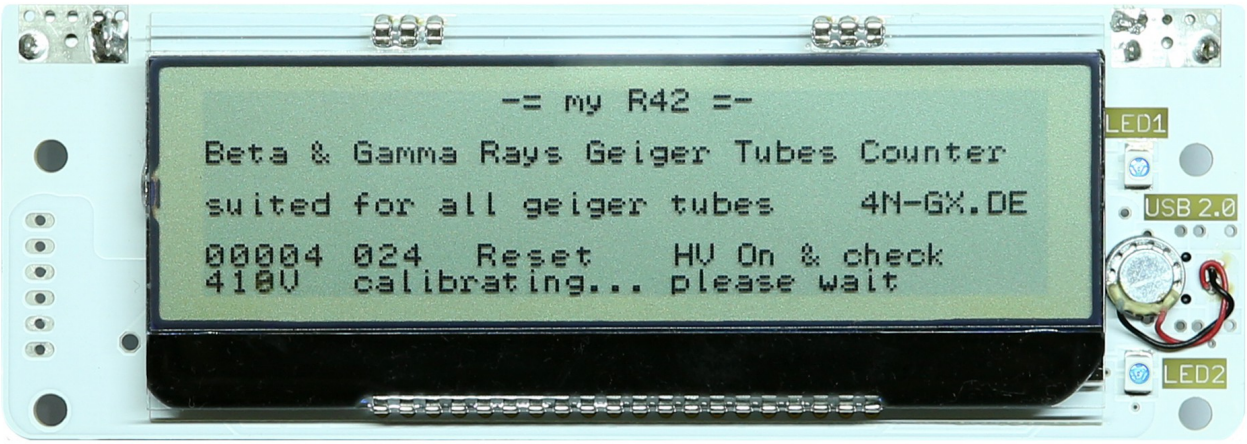
Send string “T250” ... “T700” to the R42 board. Set the geiger tube high voltage.
The voltage change need a few seconds to avoid over-voltage/under-voltage.

Examples:

T250 causes change the high voltage for geiger tube to 250V
T400 causes change the high voltage for geiger tube to 400V
T700 causes change the high voltage for geiger tube to 700V

This setting is stored in Eeprom.

Notice: Supply voltage of 3,9V is too low to generate 700V for the tube. But it is enough for 400V.
Please note the correct voltage for your tube!
Too small voltage – tube do not work or works with malfunctions
Correct voltage – tube works nice
Too high voltage – tube do not work or works with malfunctions
and the life period of the tube will decrease



Pressure Offset - P

Send string “P00000” .. “P60000” to the R60 board.

P00000..P30000 equates negative offset
P30001..P60000 equates positive offset

This setting is stored in Eeprom.

Examples:

1027,8 hPa by P=00000 Barometric Pressure - 0 offset
1005,8 hPa by P=30000 Barometric Pressure - 73 offset

1027,8 hPa by P=30001 Barometric Pressure +1 offset
1049,8 hPa by P=60000 Barometric Pressure + 73 offset

30000 ≙ 73 hPa 409,67 ≙ 1 hPa

Temperature Offset - O

Send string “o00” .. “o39” to the R60 board.

o00..o20 equates negative offset
o21..o39 equates positive offset

This setting is stored in Eeprom.

Examples:

o01 causes Temperature - 0 offset
o20 causes Temperature - 7 offset

o21 causes Temperature + 0 offset
o39 causes Temperature + 7 offset

20 ≙ 7°C 01 ≙ 0.35°C

Loop screen time - B

This setting controlling the loop times for the five displays with measurement values and graphics.
See page 16.

Send string “B0” to R42 board set the Loop time to default values.
All 5 screens will be displayed equal long time.

Send string “B1” to R42 board set the Loop time from Result screen to 20 sec.
Other screens will be displayed 1 sec. long.

Send string “B2” to R42 board set the Loop time from Parameter screen to 20 sec.
Other screens will be displayed 1 sec. long.

Send string “B3” to R42 board set the Loop time from 2 h Bargraf screen to 20 sec.
Other screens will be displayed 1 sec. long.

Send string “B4” to R42 board set the Loop time from 24 h Bargraf screen to 20 sec.
Other screens will be displayed 1 sec. long.

Send string “B4” to R42 board set the Loop time from 240 h Bargraf screen to 20 sec.
Other screens will be displayed 1 sec. long.

This setting works only if no rotary switch (or resistor) is connected to R42 board. See page 16.
Rotary switch setting is used first as B0 .. B5 setting.

This setting is stored in EEprom.

ip Correction for SBM-20 & STS-5 tubes

notice: Conversion factor 87,5 F0875 for SBM-20 & STS-5

If you are using SBM-20 or STS-5 tube then activate this function !
The correction values were determined by **Cs-137** - from **0,5 µSV/h** to **1,05 mSV/h**.
With this function the radiation results are:
+/- 5% accurate in the range from 0,5 µSV/h to 1,05 mSV/h

Send string "K0" to R42 board to turn off the ip correction function. For any geiger tubes.
Send string "K1" to R42 board to turn on the ip correction function. For SBM-20 & STS-5.

K0 works without ip correction.
K1 works with ip offset values correction table and Dead-Time correction (page 25)

This setting is stored in EEprom.

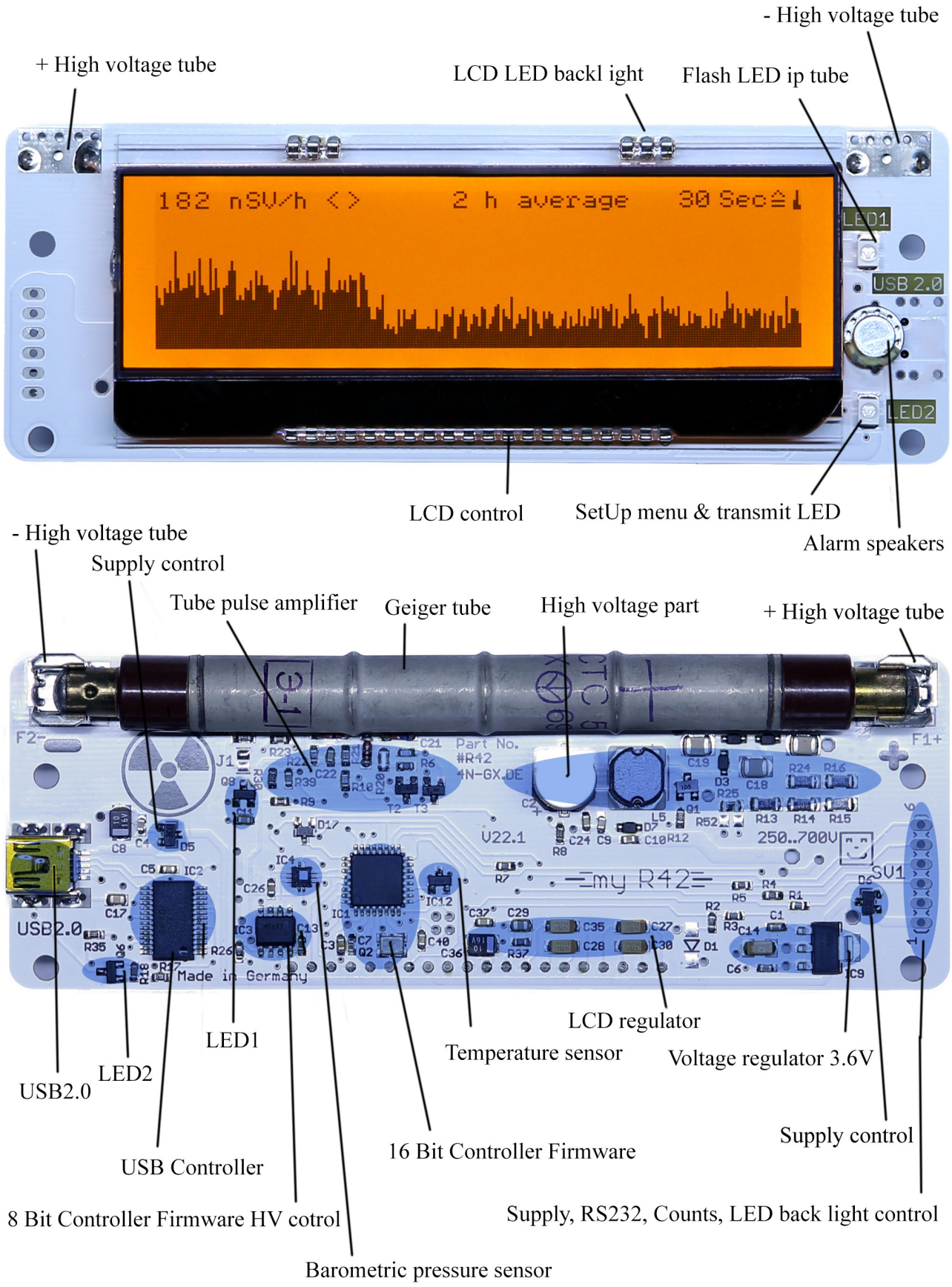
Help

Send string "Y" or "?" to the R42 board. Help command gives you back Help text.

my R42 SetUp Menu ? = Help E = Exit

any key - enter this setup menu
Y - help, this text
? - help, this text
E - exit & save to EEprom
R - Reset & clear LOGs & Restart
C - Clear all LOGs
L0 - LED off
L1 - LED on
B0..B5 - Loop screen time
K0 - ip Correctur Off
K1 - ip Correctur On
Z0 - silent mode, ton off
Z1 - normal mode, ton on
H - read hours 2 h LOG
D - read day 24 h LOG
W - read week 240 h LOG
X - read settings from EEprom
V - view live values
F - conversions factor, F0100..F8000
T - tube voltage, T250..T700
A - Alarm value, signal ton on, A0010..A9999
S - Start meassuring, S0001..S3600
P - Pressure offset, P00000..P30000, P30001..P60000
O - Temperature offset, O00..O20, O21..O39

Board structure



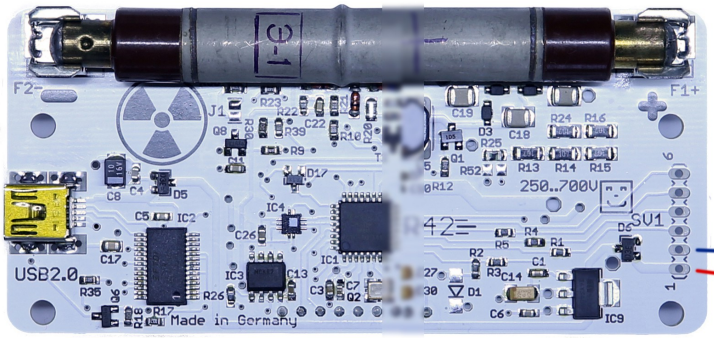
Supply voltage wiring

The R42 board need supply voltage of 3.9 .. 14.2V DC. Recommended 4.0 .. 10V DC.
You can give the supply voltage over USB2.0 or/and over RS232 interface.
The supply wires are reverse polarity protected.

Supply current by USB2.0: 12 mA (10 mA USB2.0 interface + 2 mA R42 board)
Supply current by RS232 interface: 2 mA (by 5V DC)

Supply voltage connection

USB2.0 +5V DC

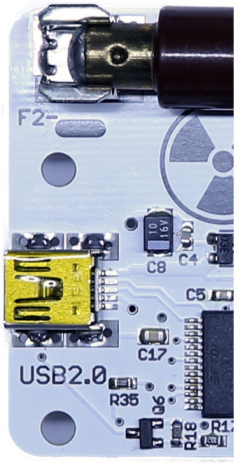


Pin 2 GND

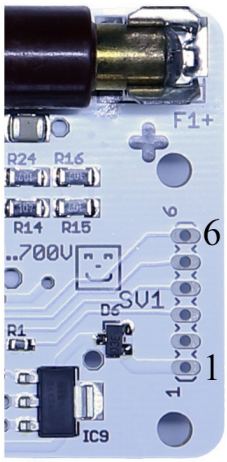
Pin 1 +3.9 .. 14.2V DC

you can connect: one side of the two OR both sides simultaneously

Connections



USB2.0 mini 5 pol.

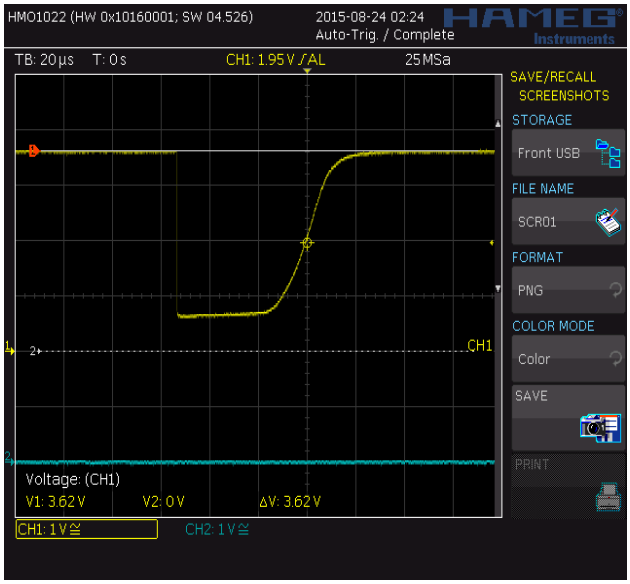


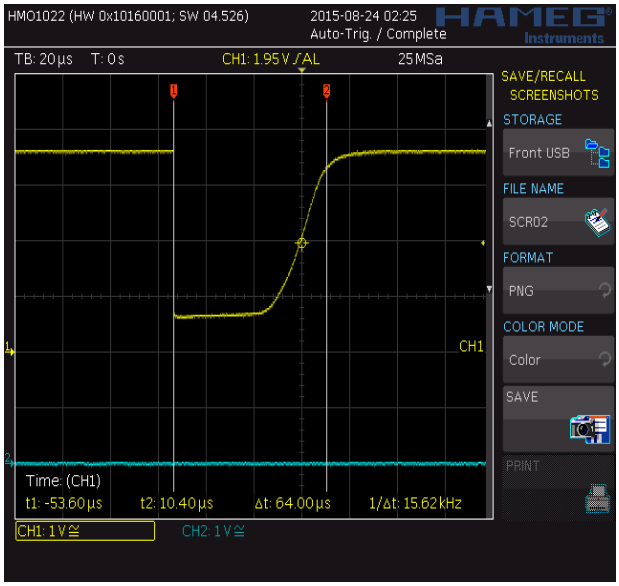
RS232 interface SIL 1 x 6 pol. RM 2.54 mm (0.1 inch)
Pin 6 - LCD LED backlight toggle ON/OFF button
Pin 5 - RXD input TTL 3.3V
Pin 4 - counts (tube impulse) negativ active
Pin 3 - TXD output TTL 3.3V
Pin 2 - GND
Pin 1 - + supply voltage (3.9 .. 14.2V DC)

Pin 6 – LCD LED backlight button input. Toggle control.
You can use this input and connected any button from this pin 6 to pin 2 GND.
If you give GND impulse to this pin 6 then the LCD LED turn on.
If you give GND another one impulse to this pin 6 then the LCD LED turn off.

Pin 5 – RXD input TTL 3.3V 115.2 kb 8N1

Pin 4 – counts output TTL 3.3V negativ active flank 60 µS long





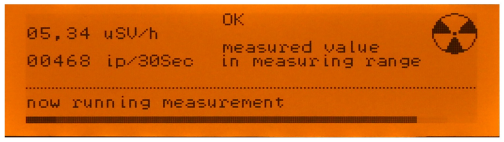
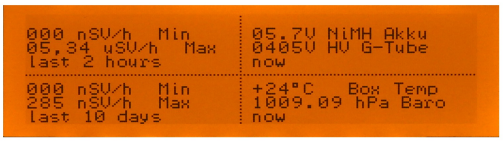
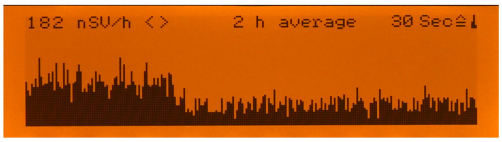
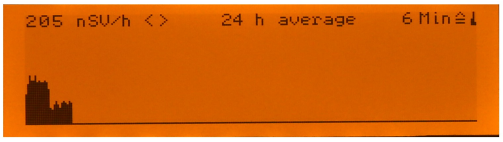
Pin 3 - TXD output TTL 3.3V 115.2 kb 8N1

Pin 2 – GND 0V

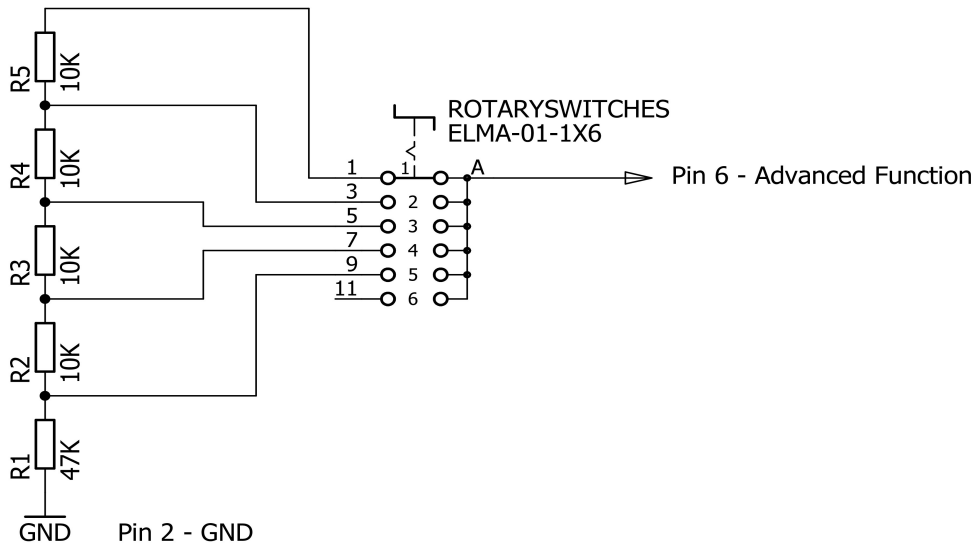
Pin 1 - + supply voltage +3.9 .. 14.2V DC reverse polarity protected

Pin 6 - Advanced Function

You can connect to Pin 6 a resistor (or potentiometer or rotary switch with resistors).
This is controlling the loop times for the five displays with measurement values and graphics.
See page 11 – B setting for Loop screen time.

standard presentation loop time			selected on pin 6 presentation loop time				
			R = 47K	R = 57K	R = 67K	R = 77K	R = 87K
14 secounds	1.		26 sec.	1 sec.	1 sec.	1 sec.	1 sec.
4 secounds	2.		1 sec.	26 sec.	1 sec.	1 sec.	1 sec.
4 secounds	3.		1 sec.	1 sec.	26 sec.	1 sec.	1 sec.
4 secounds	4.		1 sec.	1 sec.	1 sec.	26 sec.	1 sec.
4 secounds	5.		1 sec.	1 sec.	1 sec.	1 sec.	26 sec.

loop always takes 30 seconds



Status LED's

LED 1 ip tube indicator
flash pulse

LED 2 setup menu active
or
TXD active

LED 1 – this LED gives you a feedback over the geiger tube activity.
You can see flash pulse when the geiger tube deteced an impact.

LED 2 - this LED gives you a feedback over RS232 and USB activity.
flash - TXD transmit active
OFF - TXD no transmiting
ON - SetUp menu run

Alarm speaker

The alarm speaker is located between the two LEDs.
If the measured value is higher then the alarm value, then the speaker play alarm sound for two secounds.

See Alarm command

USB2.0 interface

The USB2.0 interface is located between the two LEDs.
You can use the USB connector as supply voltage for R42 board and communicate with the board.
USB controller is from FTDI ltd. FT232RL. You can find driver for all operating systems by FTDI.
Mostly an appropriate driver is installed automatically.

Drivers download: http://www.ftdichip.com/Drivers/VCP.htm

COM port settings

The correct COM port setting for communication is:
115200 baud 8 data byte none parity 1 stop bit 115.2 kb 8N1

Measured valuses are transferred every 30 seconds
Format:

00010 04.7V 397V +26°C 1013.69hPa
00012 04.7V 400V +26°C 1013.70hPa
00009 04.7V 400V +26°C 1013.70hPa
00007 04.7V 402V +26°C 1013.70hPa

RS232 settings

The correct RS23 setting for communication is:
115200 baud 8 data byte none parity 1 stop bit 115.2 kb 8N1

Measured valuses are transferred every 30 seconds
Format:

00010 04.7V 397V +26°C 1013.69hPa
00012 04.7V 400V +26°C 1013.70hPa
00009 04.7V 400V +26°C 1013.70hPa
00007 04.7V 402V +26°C 1013.70hPa

LCD

240 x 64 pixel, transflective, FSTN Positive
Part: EA DOGM240W-6 ELECTRONIC ASSEMBLY
Mouser-No.: 790-EADOGM240W-6
Doc: http://www.mouser.de/Search/ProductDetail.aspx?R=EA_DOGM240W-6virtualkey62750000virtualkey790-EADOGM240W-6

LCD back light

LED Backlight amber
Part: EA LED94x40-A ELECTRONIC ASSEMBLY
Mouser-No.: 790-EALED94X40-A
Doc: http://www.mouser.de/Search/ProductDetail.aspx?R=EA_LED94x40-Avirtualkey62750000virtualkey790-EALED94X40-A

See Connections and LED command JP1 - ON full LED current OFF 1/2 LED current

Geiger tubes

You can use any geiger tube. Please note the correct voltage for your tube!
Too small or high voltage – the tube do not work or works with malfunctions and the life period of the tube will decrease!

See Tube Voltage and Conversions Factor commands.

Example tubes:
SBM-20, SBT-9, VacuTec 70 013, DOB-50, LND-712, LND-7317, SI-29BG

Temperature sensor

LM61C Texas Instruments -30 .. +100°C Accuracy at 25°C ±2.0°C
Doc: http://www.mouser.de/ProductDetail/Texas-Instruments/LM61CIM3-NOPB/?qs=sGAEpiMZZMucenltShoSnkuGO8CMxhbWCms2NZCFcFU%3d

Pressure sensor

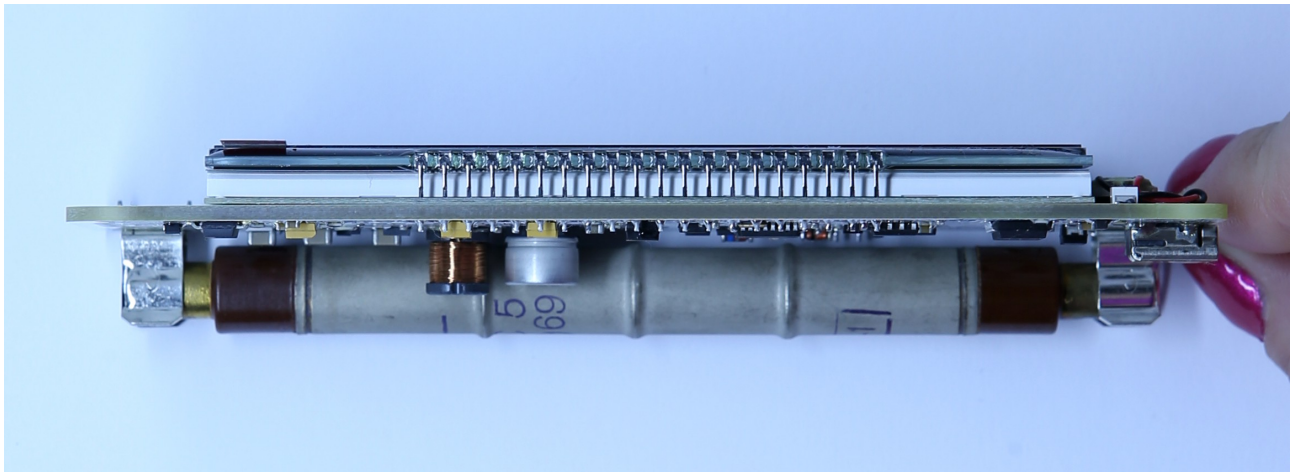
LPS25HTR STMicroelectronics 260 hPa to 1260 hPa Accuracy at 260 to 1260 hPa ± 0.2 hPa
Doc: http://www.mouser.de/ProductDetail/STMicroelectronics/LPS25HTR/?qs=sGAEpiMZZMvh0aGzCjJ9pqs8LW%2fGJSzH

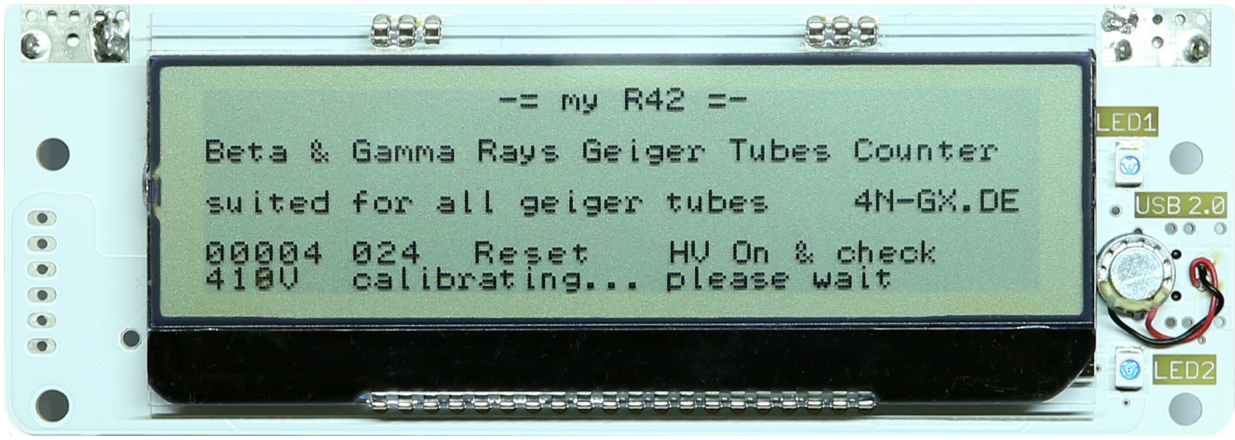
Technical specifications

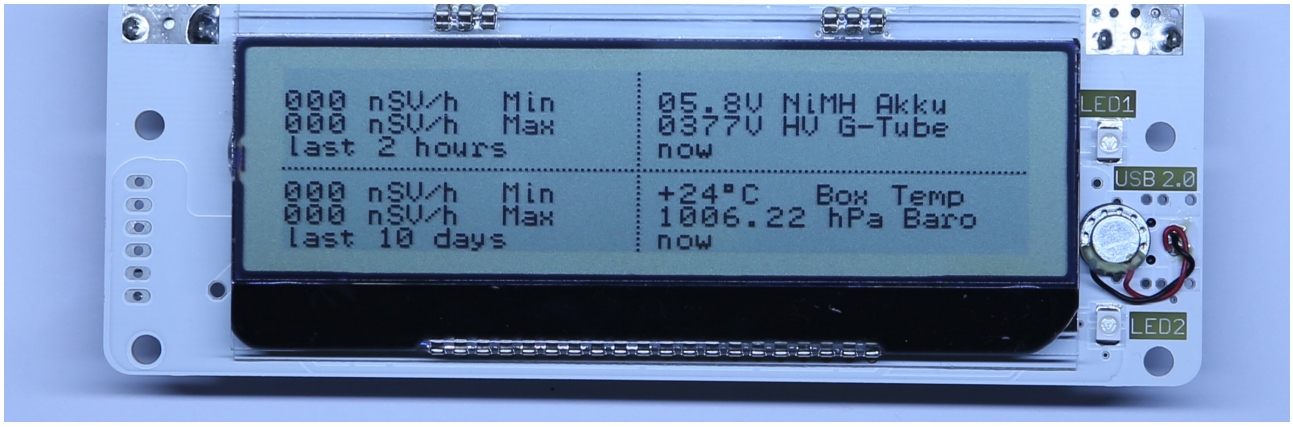
Supply Voltage	3.9 .. 14.2V DC
Supply Current	2 mA by 6V DC (LCD background light off)
Overload test	fifty times, 50 mSv/h
LC Display	Graphic LCD 240x64 pixel with amber backlight
Display ip Graph	AutoScaling graph for: 2, 24 and 240 hours
Displays windows	Yes 5x
Radiation Dose range with SBM-20	10 nSV/h .. 1mSV/h
Radiation Dose range LCD	10 nSV/h .. 10 mSV/h
Conversion Factor	10 .. 800 saved to EEprom
Alarm Value	10 .. 9999 ip/30 sec. saved to EEprom
Alarm Speakers	Yes for alarm sound melody
Geiger Event indication	LED blue flash
1. Firmware controller	16 Bit controller Freescale
2. Firmware controller	8 Bit controller Freescale
Temperature Sensor	LM61C ± 2°C
Barometric Pressure Sensor	LPS25HTR ± 0.2 hPa
Supply Voltage measuring	Yes 3.9 .. 18V DC
Tube high voltage measuring	Yes 16 Bit controller
Tube high voltage regulate	Yes 8 Bit controller 16 bit timer & PWM
USB logging support	Yes for: 2, 24 and 240 hours
USB logging data	ip/30 sec.
USB connector	USB mini 5 pol.
RS232 level	3.3V
Measurement Period	30 sec. or 1 .. 3600 sec. per Start command
High Voltage range software adjustable	250 .. 700V
PCB dimensions	120 x 44 x 21 mm
Compatible Geiger Tubes for PCB	SBM-20, STS-5, J305
Compatible Geiger Tubes for wire connection	SBT-9, DOB-50, LND-712, LND-7317, SI-29BG..
PCB RoHS 2 conform	Yes

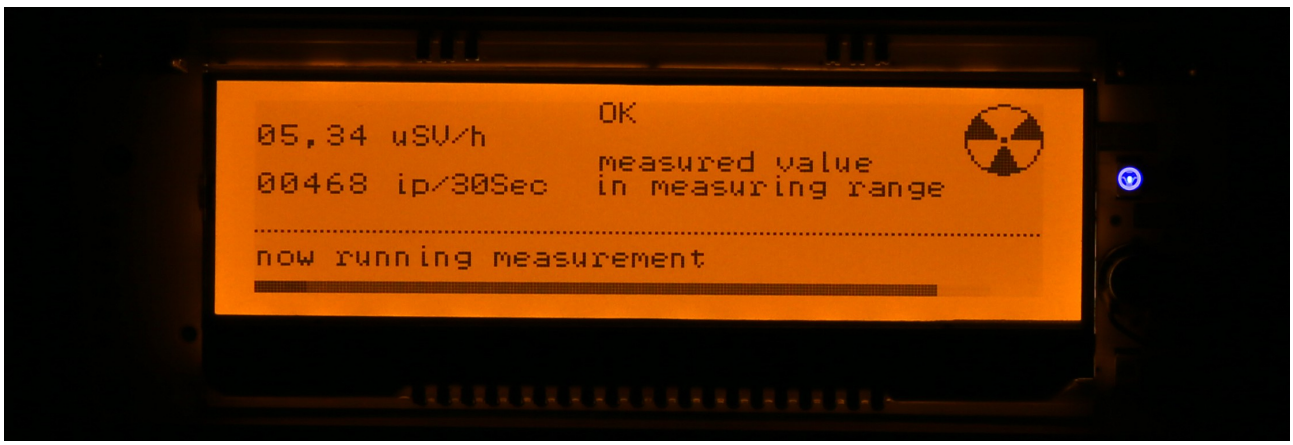
If you have feedback or ideas you are welcome :)

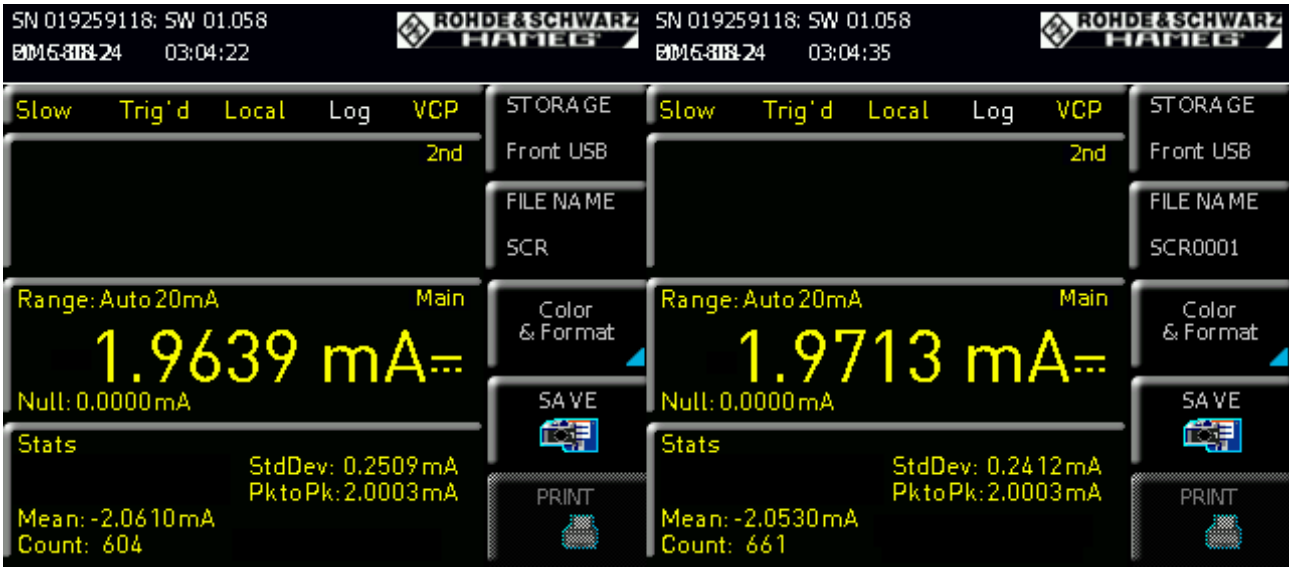
Pictures




-= my R42 =-
Beta & Gamma Rays Geiger Tubes Counter
suited for all geiger tubes 4N-GX.DE
00004 024 Reset HV On & check
410V calibrating... please wait
LED1
USB 2.0
LED2

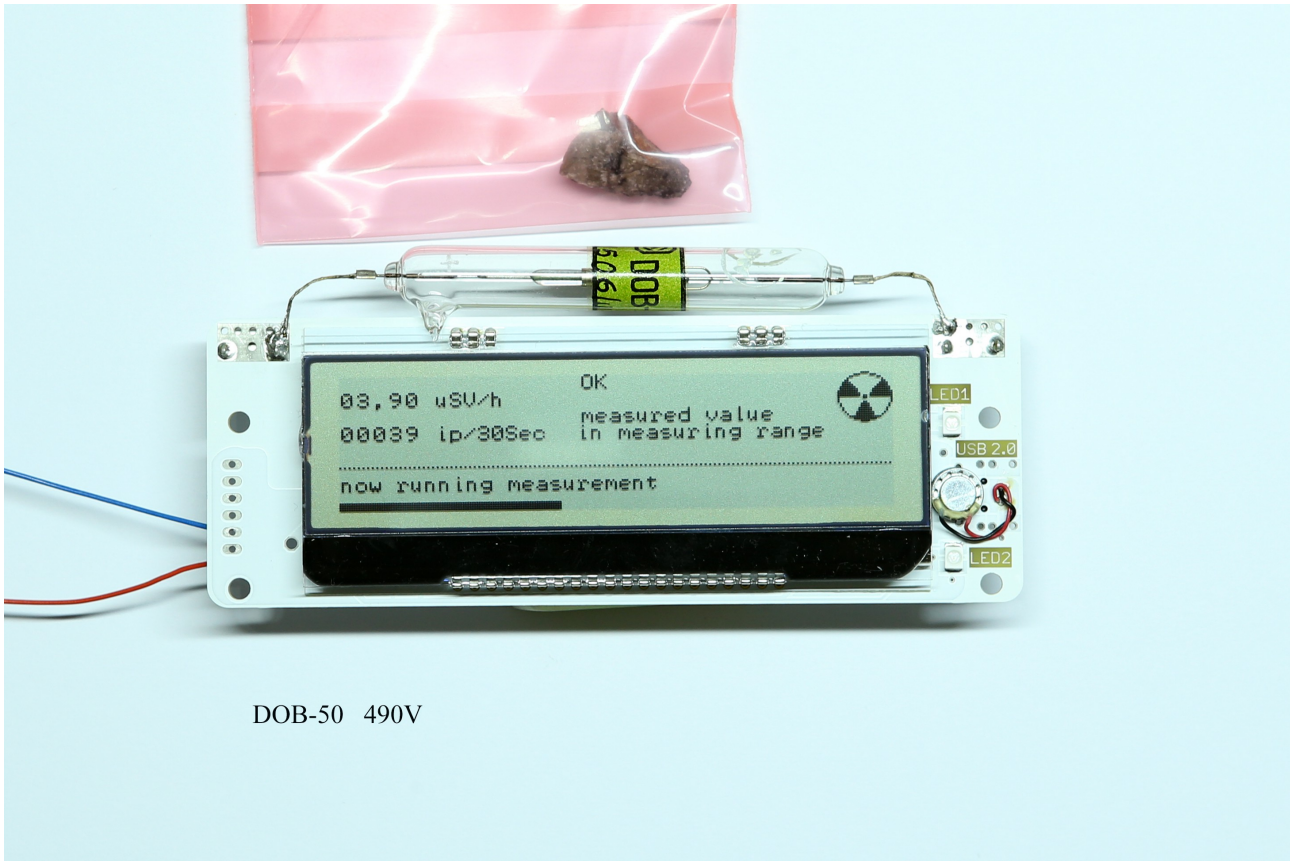

000 nSV/h Min
000 nSV/h Max
last 2 hours
05.8V NiMH Akku
0377V HV G-Tube
now
000 nSV/h Min
000 nSV/h Max
last 10 days
+24°C Box Temp
1006.22 hPa Baro
now
LED1
USB 2.0
LED2


OK
05,34 uSV/h
00468 ip/30Sec
measured value
in measuring range
now running measurement


SN 019259118: SW 01.058
03:04:22
ROHDE&SCHWARZ HAMEG
Slow Trig'd Local Log VCP
2nd
STORAGE
Front USB
FILE NAME
SCR
Range: Auto 20mA
Main
1.9639 mA
Null: 0.0000 mA
Color & Format
SAVE
PRINT
Stats
StdDev: 0.2509 mA
PktoPk: 2.0003 mA
Mean: -2.0610 mA
Count: 604
SN 019259118: SW 01.058
03:04:35
ROHDE&SCHWARZ HAMEG
Slow Trig'd Local Log VCP
2nd
STORAGE
Front USB
FILE NAME
SCR0001
Range: Auto 20mA
Main
1.9713 mA
Null: 0.0000 mA
Color & Format
SAVE
PRINT
Stats
StdDev: 0.2412 mA
PktoPk: 2.0003 mA
Mean: -2.0530 mA
Count: 661

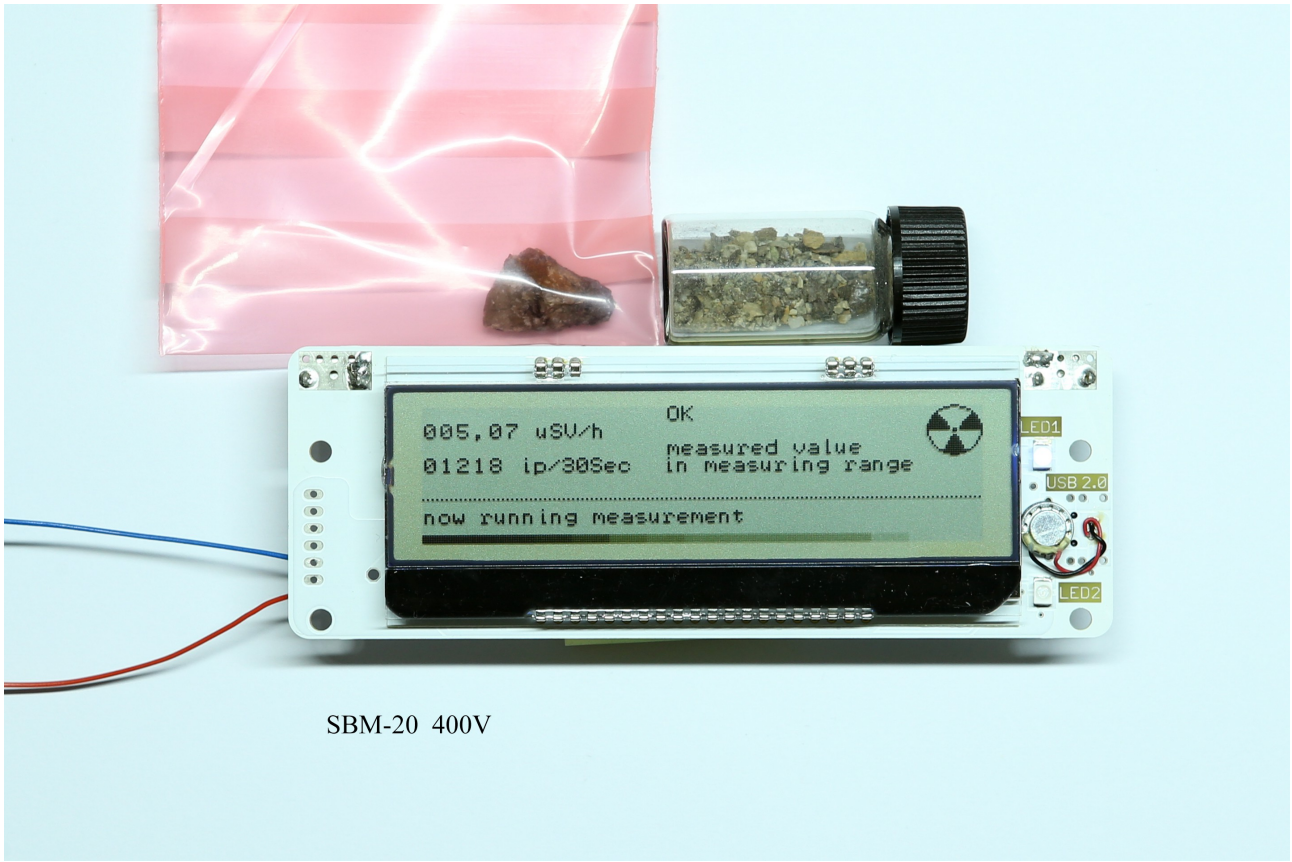

FTDI UART Terminal v1.1
Key Code
Save to File
Send File
Format - Character
Port 0; UART Setting - Baudrate:115200 StopBit:1 DataBit:8
Parity:None FlowControl:CTS/RTS
00008 04.7V 395V +20°C 0994.86hPa
00246 04.7V 395V +20°C 0994.85hPa
00350 04.7V 402V +20°C 0994.85hPa
00363 04.7V 406V +21°C 0994.85hPa
CHAR
Write
OK


MOTOROLA
congstar
05:38
FTDI UART Terminal v1.1
Key Code
Save to File
Send File
00008 04.7V 395V +20°C 0994.86hPa
00246 04.7V 395V +20°C 0994.85hPa
00350 04.7V 402V +20°C 0994.85hPa
00363 04.7V 406V +21°C 0994.85hPa
CHAR
Write

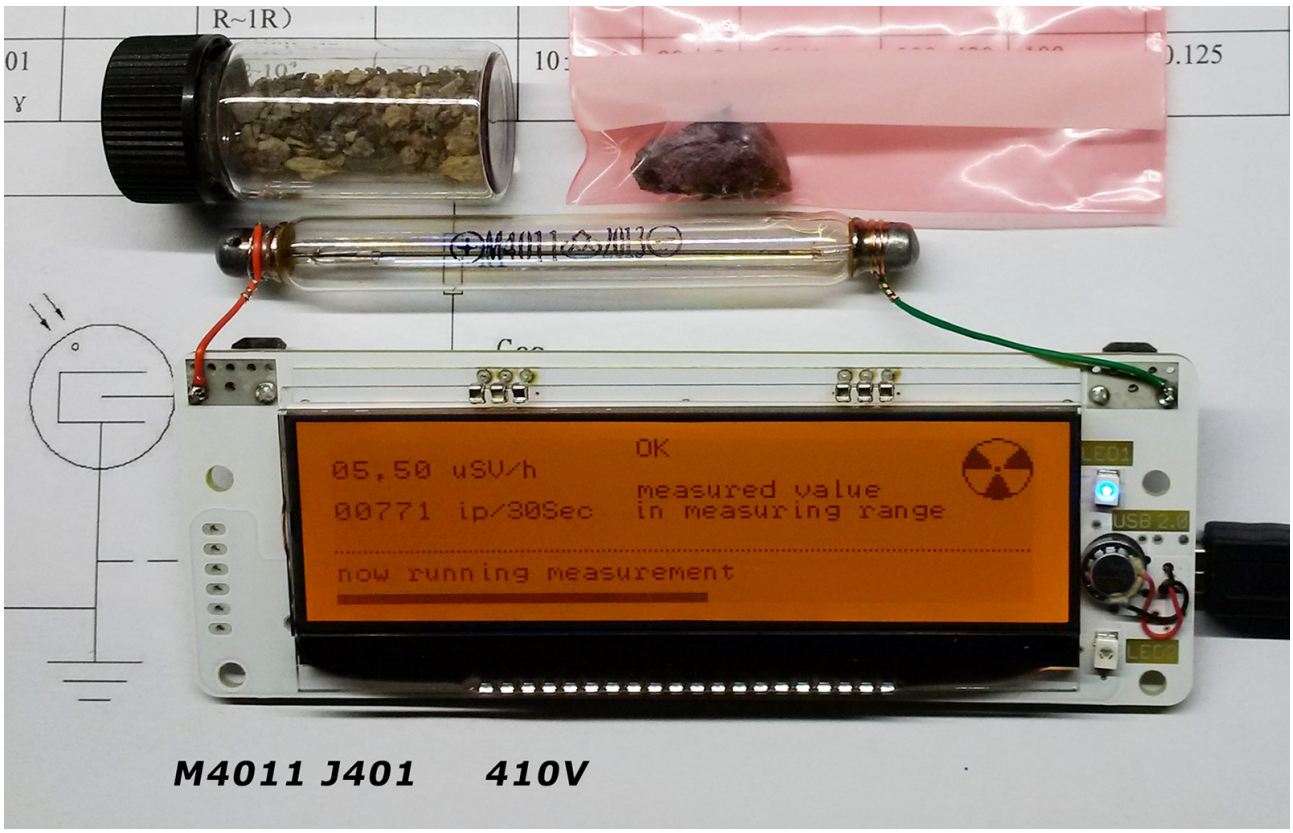

03,90 uSV/h
OK
00039 ip/30Sec
measured value
in measuring range
now running measurement
LED1
USB 2.0
LED2

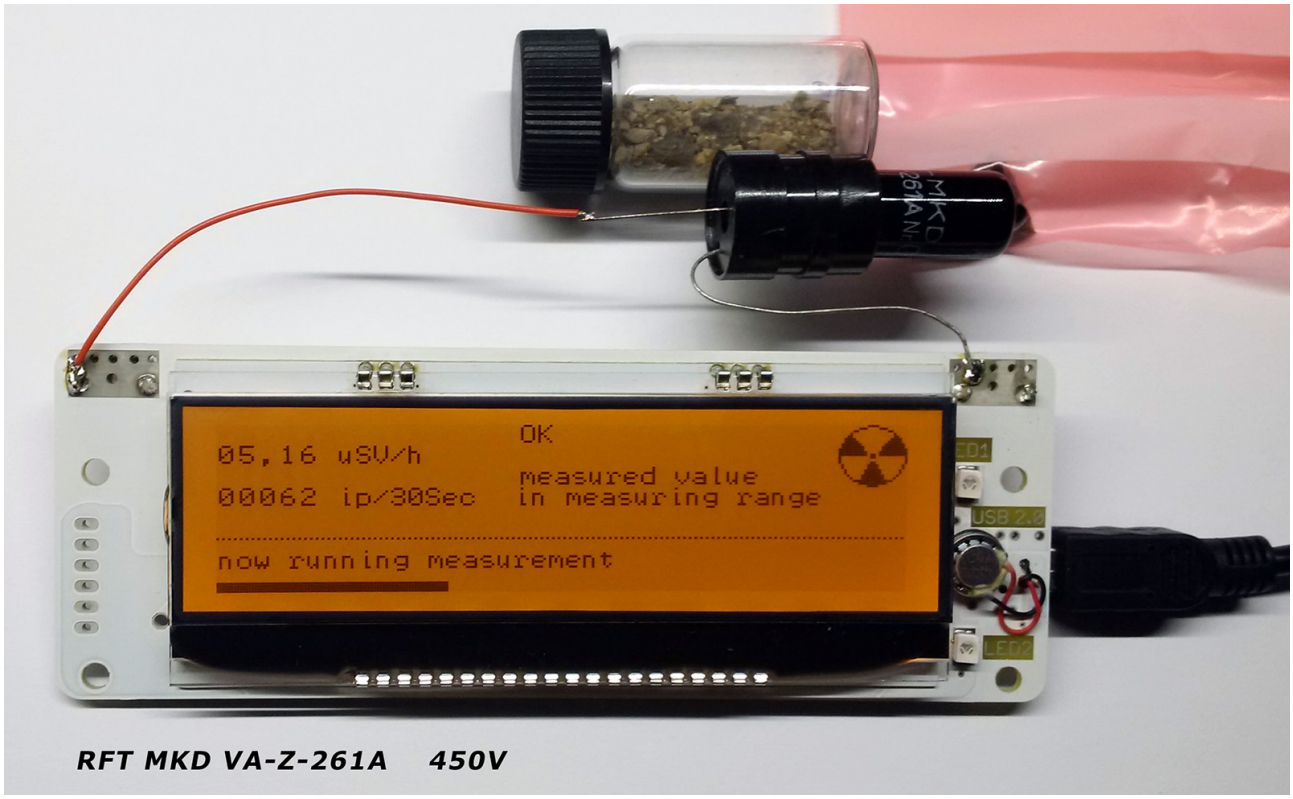
DOB-50 490V

VacuTec 710 013 450V



SBM-20 400V


05,50 uSV/h
00771 ip/30Sec
OK
measured value
in measuring range
now running measurement
M4011 J401 410V


05,16 uSV/h
00062 ip/30Sec
OK
measured value
in measuring range
now running measurement
RFT MKD VA-Z-261A 450V

... and many others geiger tubes

please notize:

In this docu are old pictures with old software.
New software is using 6 decimal places for ip/30 sec.

Conversion:

Method 2: (thanks to Mike)
This starts by simply taking an average of the two cps values for the two isotopes.
So: 29 + 22 / 2 = 25.5 cps
Multiply counts per second by 60 to get CPM: 25.5 x 60 = 1530 CPM

Now we introduce the absorption rate. There is a lot that can be said about this, but in a nutshell, it is the rate at which ionization events are absorbed into a material. (Jorge M. has written me with some very good details on the subject. You can read that here. and there are references to others using it it here and here along with Japanese Wikipedia article here. It appears that also built into this rate is a conversion from mR to uSv (1mR = 10uSv). Frankly, I am not too clear on how it is integrated!

The value for the absorption rate to be use is 8.77 which I understand is for air,
and 9.56 is for soft tissue.
So finally the 1530 CPM is divided by the absorption rate of 8.77 to get
ratio between CPM and uSv: 1530 / 8.77 = 174.46
(Or multiply 25.5 cps by 6.84)

This is the ratio that can be entered into the menu of the Geiger kit if you are using an SBM-20 GM tube. It is also very close to 175.43 (or it's inverse .0057) that is commonly found on the web for that tube.

To be consistent with this common ratio the Geiger kits use 175.43 as the default setting.
(87.5 per 30 secounds --> F875)

The Effect of "Dead Time" on Counts :

Dead time is the time after an event in which the tube will not register a count. It's like the tube is resetting. Most specs on tubes list the dead time (in uS).

Someone pointed out the formula for calculating the counts lost to deadtime based on the observed count and the published dead time for the tube. (Thanks Al!) I thought it would be worth writing it up here. You can also read more about this subject here.

To use an example from the chart above, I got **5253** CPM from the mantle on the SBM-20. The dead time for this tube is listed as **190** uS. The formula is:

ACTUAL COUNTS = OBSERVED COUNTS / 1 - (OBSERVED COUNTS * DEADTIME)

Time is expressed in seconds, so counts are counts / second, and deadtime is in seconds. So the fist step is to make these conversions . . .

5253 CPM / 60 = **87.55 CPS** and 190 uS = **.000190** seconds

Plugging this in, we have . . .

ACTUAL COUNTS = 87.55 / 1 - (87.55 x .000190)

which is . . .

ACTUAL COUNTS = 87.55 / 1 - .01663

or . . .

ACTUAL COUNTS = 87.55 / .98337

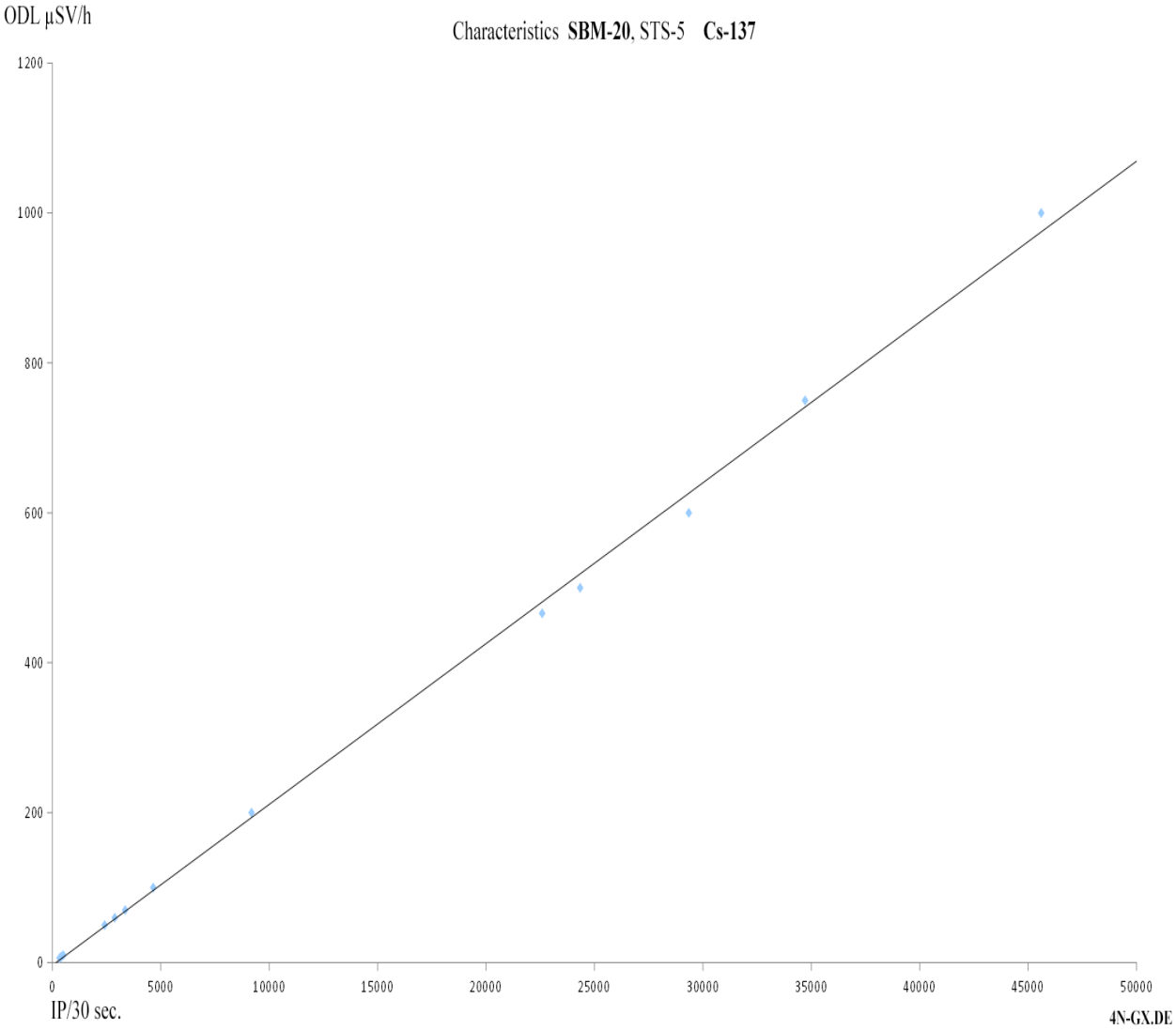
or . . .

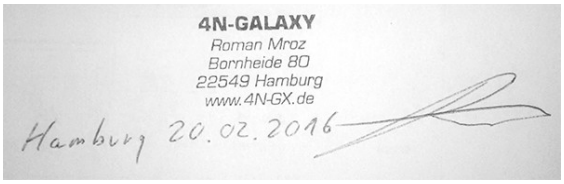
ACTUAL COUNTS = 89.03 CPS or 5342 CPM

So ~**89** CPM was lost due to deadtime (5342 - 5253) - a 1.7% loss due to deadtime.
Not much at this lower count rate but it becomes significant at higher rates.
Source:
https://sites.google.com/site/diygeigercounter/gm-tubes-supported

my R42 wurde auf einem amtlichen Prüfstand mit einem Cs-137 Prüfstrahler getestet. Entfernung zur Quelle ca. > 2,5m Ergebnis: alle von my R42 angezeigten Werte stimmen überein mit dem Ist ODL Wert. Bei einer Leistung von 1,00 mSv/h werden 1,01 mSv/h von my R42 angezeigt. Das SBM-20 Rohr arbeitet bis ca. 1,4 mSv/h. Ein 50-faches Überlasttest wurde bestanden.

Cs-137 my R42 with SBM-20 characteristics by 4N-GX
my #R42 used Dead-Time correction + SBM-20 correction table





SBM-20 Geiger-Müller Rohr

Füllgas	Ne, Br_2, Ar
Plateaubereich Spannung	400 V
Totzeit	190 µS bei 400 V
Anoden Widerstand	5,1 MΩ
Arbeitsbereich	0,004 .. 40 mkR/s
Arbeitsbereich	0,014 .. 144 mR/h
γ Sensitivität Ra_266	29 cps/mR/hr
γ Sensitivität Co_60	22 cps/mR/hr
Nullrate	1 cps
Rohr Kapazität	4,2 pF
Lebensdauer	$2 * 10^{10}$
Kathode	Rostfreier Stahl
Länge	107 mm
Querschnitt	9,9 mm (max. 10,5)
Arbeitstemperatur Bereich	-60..+70 °C
Gewicht	~ 10 g


091 nSV/h
OK
091 nSv/h
now running measurement Device No:1115
vicinity: natural
PELI
1015
Micro Case Series
080 nSV/h
OK
080 nSv/h
now running measurement Device No:1115
vicinity: natural

0000099 05.0V 00.4V 450V +20°C 1010.27hPa. 0216DN 00.45 uSv/h
0000099 05.0V 00.4V 451V +20°C 1010.27hPa. 0216DN 00.45 uSv/h
0000105 05.0V 00.4V 449V +20°C 1010.27hPa. 0216DN 00.48 uSv/h
0000374 05.0V 00.4V 448V +20°C 1010.27hPa. 0216DN 01.71 uSv/h
0000378 05.0V 00.4V 449V +20°C 1010.28hPa. 0216DN 01.72 uSv/h
0000403 05.0V 00.4V 450V +20°C 1010.28hPa. 0216DN 01.84 uSv/h
0000406 05.0V 00.4V 450V +20°C 1010.27hPa. 0216DN 01.85 uSv/h
0000403 05.0V 00.4V 451V +20°C 1010.27hPa. 0216DN 01.84 uSv/h
0000621 05.0V 00.5V 452V +20°C 1010.29hPa. 0216DN 02.84 uSv/h
0000599 05.0V 00.5V 451V +20°C 1010.29hPa. 0216DN 02.74 uSv/h VacuTec Rohr 70-013A

my R42 SetUp Menu ? = Help E = Exit
any key - enter this setup menu
Y - help, this file
? - help, this file
E - exit & save to EEprom
R - Reset & clear LOGs & Restart
C - Clear all LOGs
L0 - LED off
L1 - LED on
B1..5 - Loop screen time
K0 - vicinity: natural
K1 - vicinity: Cs-137
Z0 - silent mode, ton off
Z1 - normal mode, ton on
H - read hours 2 h LOG
D - read day 24 h LOG
W - read week 240 h LOG
X - read settings from EEprom
V - view live values
F - conversions factor, F0100..F8000
T - tube voltage, T250..T700
A - Alarm value, signal ton on, A0010..A9999
S - Start meassuring, S0001..S3600
P - Pressure offset, P00000..P30000, P30001..P60000
O - Temperature offset, O00..O20, O21..O39

my R42 SetUp Menu ? = Help E = Exit

Reference measurements CS-137

my R42 wurde auf einem amtlichen Prüfstand mit einem Cs-137 Prüfstrahler getestet. Entfernung zur Quelle ca. > 2,5m. Ein 50-faches Überlasttest wurde bestanden – 50 mSv/h.

K1 - ip Correctur On
F0875 - conversions factor: 87,5
T400 - tube voltage: 400V

Reference radiation µSv/h	LC display value µSv/h	Dead Time correction	SBM-20 correction	Overload
6	6,05		x	
7	7,31		x	
10	9,4		x	
50	48,85		x	
100	97,83	x	x	
466	450,68	x	x	
500	500,43	x	x	
1000	1,05	x	x	
1500	1,62	x	x	x
2000	2,6			x
3000	2,6			x
10000	2,6			x
50000	2,6			x

Defauld settings

```
my R42   SetUp Menu   ? = Help   E = Exit   -->>> X - read settings from Eeprom:

Alarm value..........:  0200
Conversion factor....:  0875
LED control..........:     1
Tube voltage.........:  0400
Pressure Offset......: 15000
Temperature Offset...: 00012
ip Correction control:     1
Sound control........:     1
Loop time............:     0
```

4N-GALAXY
Bornheide 80
22549 Hamburg
Germany

Declaration Of Conformity for RoHS (2011/65/EU) (RoHS 2)

The Directive 2002/95/EC (RoHS) on the restriction of the use of certain hazardous substances in electrical and electronic equipment has been transposed into national German law by the Electrical and Electronic Equipment Act (Elektro- und Elektronikgerätegesetz/ElektroG) of March 24th, 2005.

4N-GALAXY implemented this in due time to June 30th, 2006.
On June 8th 2011 the Directive 2011/65/EC (RoHS 2) entered into force and replaced Directive 2002/95/EC (RoHS).
According to §5 of the Electrical and Electronic Equipment Act (ElektroG) the following maximum concentration values are permitted in homogeneous materials as per July 1st, 2006:

Lead	Mercury	Hexavalent chromium	Cadmium	PBB	PBDE
1000 ppm	1000 ppm	1000 ppm	100 ppm	1000 ppm	1000 ppm
0,1%	0,1%	0,1%	0,01%	0,1%	0,1%

Unaffected by the ElectroG the Annex III of exemptions to the Directive 2011/65/EC remains applicable.

4N-GALAXY products listed below meet the requirements of Directive 2011/65/EC of the European parliament and of the Council of 8 June 2011 on the restriction of the of the use of certain hazardous substances in electrical and electronic equipment.

USB 2.0 converter products and RS232 converter products

This certification has been prepared and issued on the basis of currently applicable laws and regulations and our best knowledge and expertise currently available; the addressee or recipient is advised to regularly request updates hereof.
This certification replaces all previous ones relating to this subject.

Hamburg, 2015-09-30

Quality Management

4N-GALAXY

EG-Konformitätserklärung

Im Sinne der EG-Richtlinie Elektromagnetische Verträglichkeit 2014/30/EU

Hiermit erklären wir, dass die Geräte,
der Baureihen:

USB 2.0 <-> xxx #2xx & #Rxx

mit den grundlegenden Anforderungen der unter Punkt 1 aufgeführten EG-Richtlinie übereinstimmen. Bei einer nicht mit uns abgestimmten Änderung der aufgeführten Geräte veliert diese Erklärung, für dieses Gerät, ihre Gültigkeit.

Wir haben bei der Entwicklung und Herstellung folgende EG-Richtlinien und EN-Normen beachtet:

1. EG-Richtlinien	EG-Richtlinie 2014/30/EU 20.04.2016
2. Angewandte harmonisierte Normen	EN 50081-1 Störaussendung Wohn-Gewerbebereich, Kleinindustrie EN 50082-2 Störfestigkeit, Industrie

Die Übereinstimmung eines Baumusters der oben genannten Produktfamilie mit den Vorschriften der
genannten EG-Richtlinien wurde bescheinigt durch:

Anschrift der Prüfstelle Die Prüfungen sind in Eigenverantwortung durchgeführt worden.

Hamburg, den 10.03.2016

i.V.Mroz
(Manager Development & Production Division)

Die Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. ~~Die Sichercheitshinweise der mitgelieferten Produktdokumentationen sind zu beachten.~~

Hinweise:
Geräte Online_Dukumentation ist zu beachten.
Es ist vor der Inbetriebnahme eines Gerätes generell zu prüfen, ob dieses Gerät oder Modul grundsätzlich für den Anwendungsfall, für den es vorgesehen werden soll, geeignet ist.
Sollten Sie sich über den korrekten Anschluß nicht im klaren sein oder sollten sich Fragen ergeben, die nicht im Laufe der Online_Dokumentation abgeklärt werden, so setzen Sie sich bitte mit uns in Verbindung. Online_Dokumentation ist unter der URL: http://www.4n-galaxy.de **abrufbar.**

4N-GALAXY
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