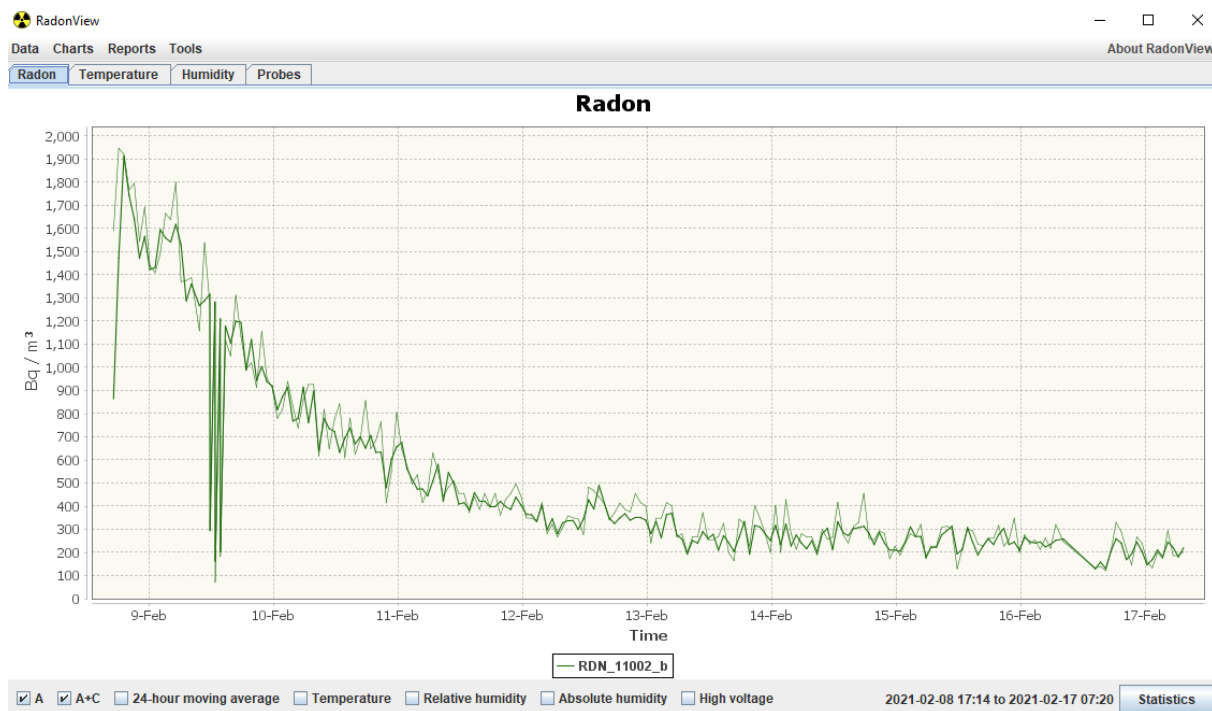


RadonView

User Manual



Program vyvinutý Martinem Kočičkou a Státním úřadem radiální ochrany (<https://www.suro.cz/cz/>)
Developed by Martin Kočička and the National Radiation Protection Institute (<https://www.suro.cz/en/>)

RadonView

Computer program for visualization and analysis of data files exported from radon concentration measurement devices made by TESLA (RADIM 3A, RADIM3AT, TSR4, TSR4M, TSR3DN, TSR3DNM, TSR4S, TSRE1, TSR3P, TSR3, TSR2, TCR3, TCR4, TCR4A) and device Saphymo-Bertin (ALPHAGUARD) .

Disclaimer

Manual is **not** written by authors of the program. This manual is primarily for the users of Radon probes developed by TESLA.

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1. Introduction – Download and installation

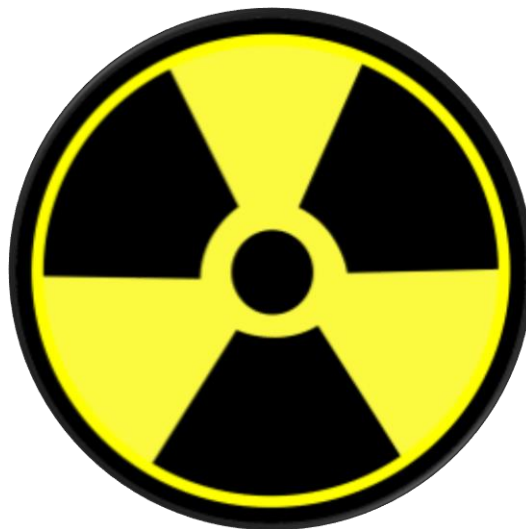
RadonView uses Java. To ensure the correct function of the program you should install the current version of Java (available at <https://www.java.com/en/download/>).

If you are using an older operating system it is possible you will run into issues with the newest version of Java. Archive of older versions is available at <https://www.oracle.com/cz/java/technologies/oracle-java-archive-downloads.html>.

Before downloading RadonView read EULA (end-user license agreement) available at <https://www.suro.cz/en/prirodnioz/suro-software-data-processing-from-continuous-rn-monitors/end-user-license-agreement>.

The program is available for free at <https://www.suro.cz/en/prirodnioz/suro-software-data-processing-from-continuous-rn-monitors>. To download the version for Windows (and Linux) click the link RadonView - exe file for Windows and jar file for Linux. To use the RadonView program extract the downloaded archive to any file on your computer.

The program can be launched by double-clicking on RadonView.exe or RadonView.jar.

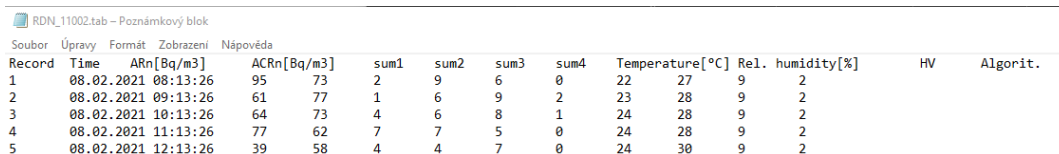


RadonView Icon

2. Importing data

Data format

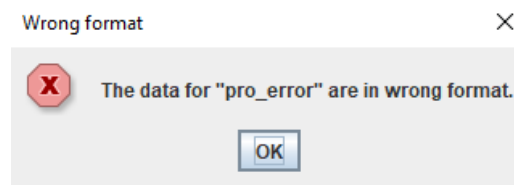
RadonView can read many common files used for data storage (.txt, .tab, .csv). To correctly read a file the data needs to be formatted in a specific way. Programs used to read data and export data from radon probes provided by TESLA (using **usbRADONview**) exports data in the correct format (shown on a picture underneath this text). It is not recommended to view your data in Excel or similar spreadsheet editors. To simply view or edit data use standard text editors (for example notepad provided as a part of Windows).



The screenshot shows a Notepad window titled "RDN_11002.tab - Poznámkový blok". The data is presented in a table with the following columns: Record, Time, ARn[Bq/m3], ACRn[Bq/m3], sum1, sum2, sum3, sum4, Temperature[°C], Rel. humidity[%], HV, and Algorit. The table contains 5 rows of data.

Record	Time	ARn[Bq/m3]	ACRn[Bq/m3]	sum1	sum2	sum3	sum4	Temperature[°C]	Rel. humidity[%]	HV	Algorit.
1	08.02.2021 08:13:26	95	73	2	9	6	0	22	27	9	2
2	08.02.2021 09:13:26	61	77	1	6	9	2	23	28	9	2
3	08.02.2021 10:13:26	64	73	4	6	8	1	24	28	9	2
4	08.02.2021 11:13:26	77	62	7	7	5	0	24	28	9	2
5	08.02.2021 12:13:26	39	58	4	4	7	0	24	30	9	2

Example of correctly formatted data file



Example of an error that occurs if you are using wrong data format

How to load data

This section describes how to load data exported from radon probes TSRX and TCRX probes (using **usbRADONview** program), or data formatted in the same way.

If no data is currently loaded in the memory of the program you can click *No data loaded!*

Click here to load data to open a file browser where you can choose your data file.

Otherwise, you can open the file browser using the shortcut **Ctrl+O** or by clicking the option *Data>Load from file*. Loading data using these options removes previously loaded data from the program memory.

If you want to load multiple data files at the same time you can select multiple files in the file browser by holding left Ctrl and left-clicking on the desired files. If you want to add additional files while not losing the currently imported data click the *Data>Add from file* option. Viewing multiple data files at once is useful when you are measuring radon concentration in multiple places using multiple probes (eg. different rooms). Data is displayed depending on the time of measurement. If data is from different time periods it will lead to poor scaling on the time axis. By loading files this way, you will not lose previously imported data.

Additionally, you can load data exported from RADIM 3A/3AT with the *Data>Radim 3A>Load from file/Add from file* (exported data has a different format, not supported by the standard *Load/Add from file* function). In the same way using the *Data>AlphaGuard>Load from file/Add from file* you can import data from AlphaGuard probe. This data can be used with the data imported using the previous methods.

You can save the data currently held in the programs memory using the *Data>Save to file* option. Exported files can be loaded using the *Data>Load from file/Add from file* options. Additionally, you can rename the individual imported data (the default name of the data is the same as the imported file). To rename your data choose the *Data>Change probe names option*. For example, you can rename the probes to the mark in which rooms they are placed (eg. a living room and basement).

You can exit the program using the *Data>Exit* option or by pressing the **Ctrl+Q** shortcut.

3. Data visualization

General options

After importing data, a graph will appear showing radon concentration development with time on the y axis. Automatic scaling is set in a way to show all the data. To show a contextual menu right-click on the graph. The Properties... option allows you to change some colors, title, axis labels, or rotate the graph. These options are not important for function of the program, but you can change the appearance of the graph.

The Copy option saves the current graph into your “copy memory” (clipboard). You can copy the plot into MS Word, painting, or other programs. You can save the plot as a png file with the *Save as > PNG* option. To print the graph, you can use the *Print...* option.

There are also options to zoom in or zoom out on either axis or both at once. The most useful option is the *Auto Range>Both Axis*, which allows you to return to the original view (where you can see all the data). For better control over the zoom feature, you can click and drag with your mouse over an interesting region, which will be zoomed on. The chosen region will be shown in the entire graph window.

Additional options which change the appearance of your graph are in the top bar of the program, the *Charts* menu:

Charts>Show points is an option that marks each data point, not just lines between them.

Charts>Use spline interpolation allows you to smooth the data curve using the spline interpolation. This method does not work well with sharp changes in radon concentration.

Sub-options in *Charts>Radon* allow you to hide/show all radon plots. Sub-options in *Charts>Probe windows* do not change anything we know of. We found both of these options useless.

To hide/show individual lines, click on their names in the graphs' legend. Those in bold letters are shown, in normal text are hidden.

In the main window above the graph are tabs Radon, Temperature, Humidity, and Probes. Additional tabs can be opened (see chapter Advanced functions). Some tabs can be closed using the X button next to the name of the tab (the original 4 tabs cannot be closed).

To show data only between selected dates (and time) left-click on the time/date in the bottom right corner of the program (next to the *Statistics* button). A window opens which allows you to enter times between which will data be shown. For the change to take effect click *OK*.

The *Statistics* button shows you a simple analysis of viewed data (including zoom). If you have multiple data lines shown (data from more probes), an analysis of all will be provided. Shown values are minimum, maximum, mean value a standard deviation.

All described functions work in every tab (except the tab Probes).

Tab Radon

Note: Statistics option in this tab works only on radon concentration, method A and A+C (excluding *24 h moving average*).

Tab radon is most important part of the program. Underneath the graph are additional boxes, if ticked they show additional lines in the graph showing the selected value. By default, **A** and **A+C** options are chosen. A is the light green line that shows the radon concentrations calculated using only ^{218}Po activity. A+C is the dark green line showing the radon concentration calculated using the activity of ^{218}Po and ^{214}Po . For a more detailed explanation of the measurement methods see the manual for your radon probe. Not all radon probes use both methods of measurement, for example, Radim 3A/3AT and ALPHAGUARD, use display method A (not necessarily meant to represent used algorithm, as some probes work differently).

All lines are green, differentiated by the line style. If you cannot identify the line you are looking for, we recommend hiding and redrawing the line and observe which one reappears. Axes for additional lines are shown on the right side of the graph (except radon concentration which is on the left).

24-hour moving average shows mean radon concentration in the previous 24 hours. Two lines are shown, one belongs to method A calculation and the second one to the method A+C with the same color coding as the original A and A+C. This option is useful for very long

measurements with minimal changes in radon concentration. For more fine control of moving average, you can use tab *Radon moving average*, see chapter *Advanced functions*.

The next three options show atmospheric information - **Temperature**, **Humidity**, **Absolute Humidity**. It is information for your use. Probes measure these for correction during radon measurement.

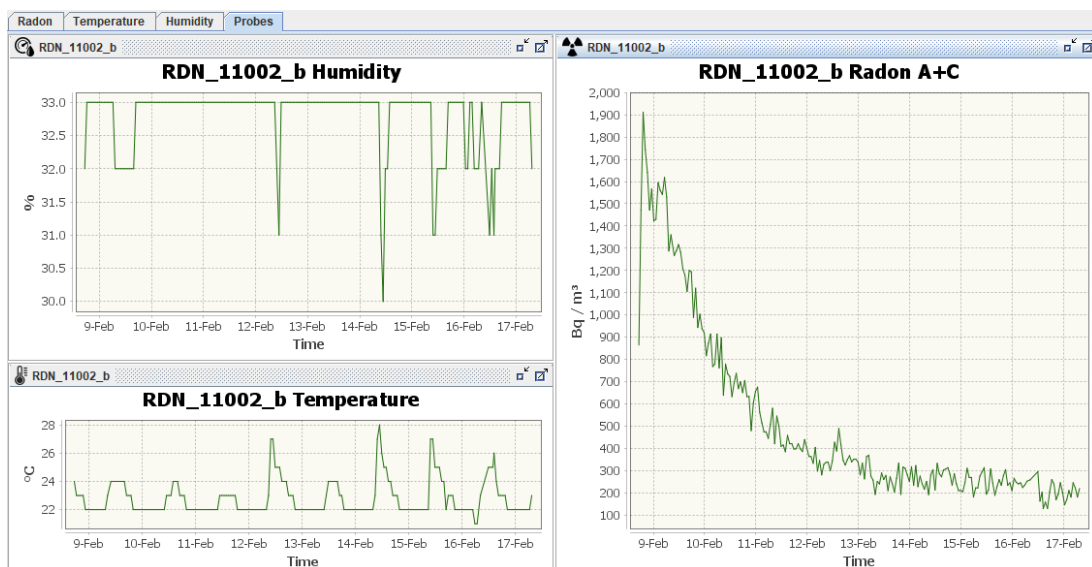
The last option, **High Voltage**, is used for diagnostic purposes. It informs you how often is the high voltage recharges. Values are typically be between 7 and 11, depending on humidity (higher the humidity higher the number). Very high values might indicate a faulty device.

Tabs Temperature a Humidity

Tabs *Temperature* and *Humidity* show the development of the quantity of the same name. All general functions are available.

Tab Probes

Tab *Probes* is used to view multiple plots at the same time. Each probe shows 4 main graphs. Individual graphs can be minimized (left) or shown in the entire window (right) using the buttons in the top right corner in the graphs' window. The size of the graphs can be changed by clicking and dragging the side of the window (same as windows in OS Windows).



Example of modified tab Probes

4. Advanced functions

Opening new tabs

In the menu *Tools>Show chart* there are four additional tabs showing addition quantities measured by the probes:

Sum shows the internal counter used for radon concentration calculation. It shows a sum of detected impulses that are between defined discrimination levels (set in the probes, not this program). A more detailed explanation is available in the individual probe manuals. In the submenu, you can choose which sum to plot, with the option of absolute sum (of sums) or showing all of them at once.

High voltage works the same as in the tab *Radon* but an individual plot.

Absolute humidity works the same as *the Humidity* tab but shows absolute humidity.

Radon moving average shows the moving average of radon concentration. In the bottom left corner, you can choose (time) length which is used to select the interval over which is the average calculated. Shorter intervals are better if the radon concentration is changing quickly. Longer intervals result in smoother lines, but you will lose information about sudden environmental changes.

Spectrum to load spectral data, you will have to load data differently. Choose option *Tools>Spectra>Load from file* and choose exported spectral data file (from program *usbRADONview*). A window will pop up that asks you from when to when you want to read the spectral data. We recommend choosing a smaller time period (3 to 5 days max, without changing the time to measure spectra in the probe settings) to not view too many spectra at once. This tab is useful for probe diagnostics. Using the Discrimination levels, you can change the background of the graph, but it does not change the sum data (tab *Sum*).

Warning: If you view too many spectra at once, the graphs' legend might take up the whole graph window.

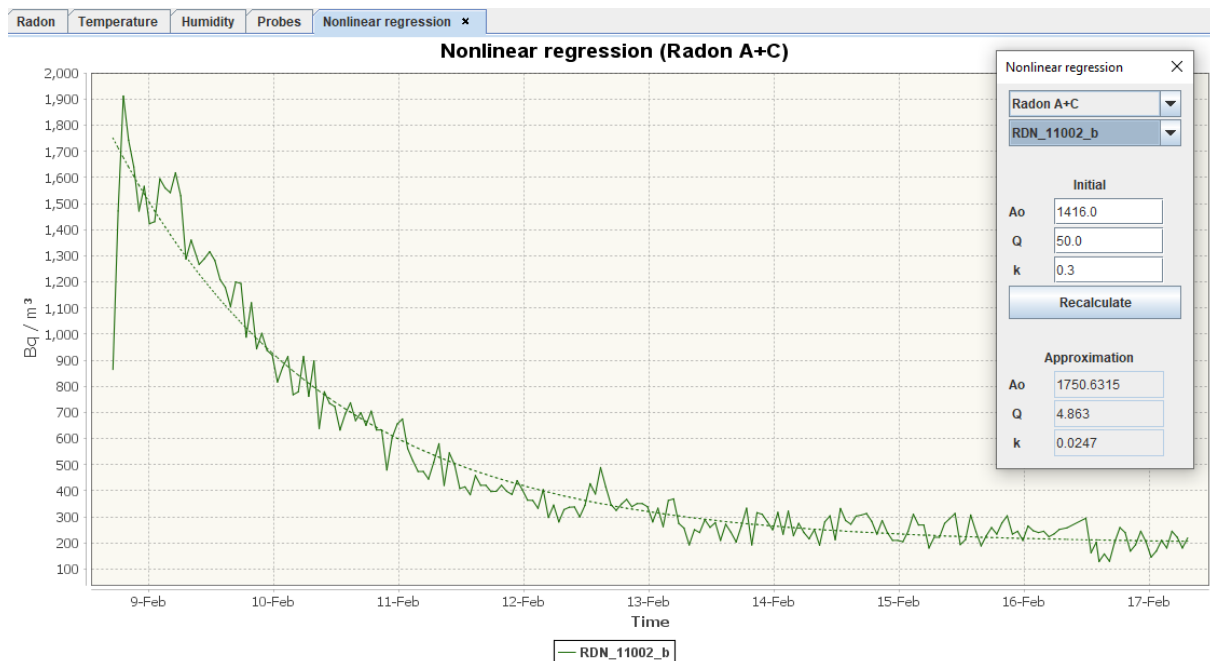
Radon concentration at your workplace

By clicking the *Reports>Workplace* option you can calculate mean radon concentration during the set „work hours“: Set dates between which you want to calculate the mean and days and times when you (or someone else) is expected to be in the same room as the radon probes. The program calculates mean radon concentration during the “work hours”. This can be used to calculate an estimate of an effective dose. We are not liable for any damage caused by the use of this program.

Nonlinear regression

Tools>Nonlinear regression opens a tab *Nonlinear regression*. In this tab you can fit your data behaviour using a pre-set model. You can fit three data types: radon concentration method *A* and *A+C* and sum data. The result of nonlinear regression is a prediction of three parameters: **Q** – the rate of radon entry, **k** – ventilation coefficient, and **A₀** – initial condition (radon concentration). More details about this theoretical model can be found in the manual for RADIM 3AT (in chapter Determination of ventilation coefficient, the manual is available at <https://www.tesla.cz/en/>)

In the top part of the *Nonlinear regression* window, which pops up when the nonlinear regression tab opens, you can choose which data (radon concentration A or A+C, or sum) and which value you want to fit. In the middle part of the window titled *Initial* you can choose your initial parameters. If your data does not look like the one predicted, you can try to change these initial parameters to get a better approximation. The last part of this window titled *Approximation* shows the approximated values of the parameters. The used model needs a constant rate of radon entry and ventilation coefficient. If one (or both) of these parameters changes (eg. someone opens a window) this simple model is not enough to describe the situation. If there is more than one exponential growth (asymptotic growth to a maximum) or decline present this model is not detailed enough.



Tab and a window nonlinear regression

5. Connecting RadonView with TERA system

For successful connection of terminal TCRX to program RadonView, you need a correct USB driver. The USB driver is available at <https://www.tesla.cz/en/>. On the website, you can find a manual that describes the driver installation (as a part of the manual for program TERAvie).

To load data from the TCRX terminal choose Tools>Load data from TERA. Importing data using this option removes all other data from the program. This will download all the saved data (except spectral data) from the terminal. You can use data from TERA same way as if it was imported from other probes.

To download spectral data choose the Tools>Spectra>Load from TERA option- You will be asked from which probe (connected to the terminal) you want to download the spectral data. There is also an option to save (export) the spectra.

The option Tools>Tera signal strength is unfortunately not implemented. To check your signal strength use the TERAvue program available at <https://www.tesla.cz/en/>. This program is a standard utility for using the TERA system.

Revize	Datum	Notes
Rev.1:	28. 2. 2021	First edition