

The Right Tool for the Job



- 13 minute radon response
- ‘Instantaneous’ thoron
- High sensitivity
- Rapid recovery
- Test the water on site
- ‘Zero’ background
- Auto report generation
- Unsurpassed CAPTURE® software
- RAD7, over 4,500 sold

The right tool for the job

Several years ago, at an AARST conference, a mitigator stood up and described his “mystery house” with a high radon level and a closet, in the middle of the house, with an even higher level. He had tried everything. including testing the closet wall for radon emission, but found no solution to the mystery.

After his talk, I got up and said “You need the right tool for the job - and I am going to lend you one!”

A week or so later, with an invitation from both the house owner and the mitigator to visit, I turned up with a RAD7.

Sniffing in the closet, we found radon coming in through a hole around a wire bringing in power to a light over the door. The wire chase had an extremely high radon level. It connected with a closed cavity under the garage floor. In that cavity the thoron level was high, showing that the exposed ground surface in that cavity was the radon entry point. After that revelation, mitigation was straight forward.

The above is just one of many similar tales that illustrate the mantra “You need the right tool for the job”.



13 minute response time

With no electronic massaging of data, the RAD7 takes just 13 minutes to reach 95% of the true equilibrium value after a step change in radon concentration in the measurement chamber.

This speed permits a rapid survey of radon values in different spaces in a house, sniffing for radon hot spots.

When a mitigation system is installed, the RAD7 can monitor its operation in real time, switching on the system and watching the radon concentration drop. The data can be graphed and printed in a report for the customer.

A full 48-hour, EPA protocol test can be completed in 48 hours. The data for every hour, including the first three hours, are valid. The RAD7 will clearly show peaks, should they occur, during high water use, indicating a possible radon-in-water problem, and show any dips whose only explanation is tampering by moving the instrument outside or opening a window.

Instantaneous Thoron reading

The thoron peak in the alpha spectrum generated by the RAD7 comes from the decay of ^{216}Po , in the thoron decay chain. This has a half life of just 145 milliseconds. So the response time of the RAD7 to a step change in thoron is just over half a second, virtually instantaneous. This is a true, direct thoron reading made simultaneously with the radon reading and independently of it.

Note that the response times listed do not include sample acquisition times that would typically be one minute or more.

Thoron almost invariably coexists with radon in the soil. Soil gas entering a home is often loaded with more thoron than radon, but the thoron, with its 56 second half life lives for only a few minutes. If there is little or no air movement in a house then, while the radon will spread throughout a room & house, thoron will only be found close to the radon entry point. Sniffing for thoron, therefore, is an efficient way to locate radon entry points. In the middle of a room or basement there will be little or no thoron, if the air is still. But sniffing for thoron along the edges, near cracks, in sumps, and near service penetrations of the floor will likely reveal radon entry points, should they exist.

High sensitivity

The high sensitivity of the RAD7, combined with its fast response, makes it the instrument of choice for many applications and has permitted a variety of accessories to be developed that would otherwise not be practical.

Home Inspectors before they start an inspection, go to the basement, close any open windows and set up and start the RAD7 doing a two-hour test with 15-minute cycles. Two hours later, at the end of their inspection, The RAD7 has printed out eight readings. They throw away the first and average the remaining seven for an accurate, spot reading of the radon in the basement over those two hours. This is not an EPA protocol test, but invariably is found to be very close to an EPA-compliant 48-hour test should it be performed later. It is guaranteed free of tampering as the home inspector was there throughout the two hours.

Outside air measurements are a breeze with the RAD7. The sensitivity is high enough to make such measurements, with reasonable precision, practicable. Thoron and radon readings, with their very different half lives, make it possible to study phenomena, such as atmospheric diffusion and plume tracing, with time scales of minutes, with thoron, and days, with radon.

The RAD7 also lends itself to both surface and bulk emission measurements, and the measurement of radon in open water, well, ground and tap water.

Rapid recovery

If a house is measured that has a high radon concentration, a RAD7 user doesn't have to escape in a hurry to keep the count rate down in his instrument, or wait for another day to make more measurements, or stock up on new cells to swap in for radon-polluted, or high background cells that have lost their ability to make low radon measurements. A RAD7 user can take his/her time to make the readings that are necessary before moving on to the next room or next house.

The RAD7 automatically starts a new reading in Sniff mode, looking only at ^{218}Po decays, with their 3-minute half life. After the air with a high radon concentration has been purged out of the instrument, it takes only 15 minutes for the count rate to drop to 1/30th and 30 minutes for it to be down to one thousandth, of the high rate. So there's no reason to delay starting the next measurement.

Test the water on site

The RAD H2O radon-in-water accessory has been on the market for 20 years. Many hundreds have been sold. It is used in laboratories, teaching institutions from high schools to universities, commercial enterprises and government institutions world wide. With this accessory, the lowest radon concentration in the water, for a reasonable measurement, is around 10 pCi/L or 400 Bq/m³

If there are peaks in the air radon concentration in a house around the times of peak water use, or if the house is fed by a well, the water needs to be tested.

The RAD7's high sensitivity and fast response enable a measurement of radon in water, with the RAD H2O, as accurate as liquid scintillation, to be started as soon as the sample is drawn and completed 30 minutes later. In other words, the radon concentration in the water can be printed and handed to the customer within an hour of taking the water sample.

Other accessories, designed for oceanographers and volcanologists, are able to make measurements down to much lower radon concentrations.

Zero background

The background of a RAD7 is equivalent to less than 0.005 pCi/L, or 0.2 Bq/m³. Effectively zero compared with indoor radon levels. Unlike other instruments, this remains unchanged throughout the life of the RAD7, regardless of its age or intensity of use.

²¹⁰Pb builds up in every radon instrument. The RAD7 realtime spectral analysis sees the resulting 5.3 MeV peak but ignores it completely. Other instruments are unable to separate that background from current measurements. Their ever increasing background cuts off their ability to measure low radon concentrations.

Pulse ionization devices, while they may claim a huge operating range of 6 or 7 orders of magnitude when new, in practice, users need to restrict that range to just 3 orders of magnitude if they want to keep using the instrument within the same range on a regular basis for more than four years.

Lucas cell users need to keep replenishing a stock of new cells and use them only for known low radon concentrations, to keep them capable, for a while, of making such measurements.

RAD7s are used in clean rooms and in nuclear physics underground laboratories around the world, where radon concentration is measured in mBq/m³, or thousandths of a pCi/L, and significant background in the measuring instrument is unacceptable.

Automatic report generation

CAPTURE the DURRIDGE RAD7 software automatically downloads the data from a RAD7 and displays the graph.

There is an export function that takes user-selected data and formats it in several different ways, chosen by the user. It can produce a file for import into a database or spreadsheet and it can generate a customer report of the measurement. If you have a printer with you, you can print it out and present it to the customer there and then.

Unsurpassed **CAPTURE** software

CAPTURE, DURRIDGE's Mac and Windows software, automatically downloads and displays the data from a RAD7. It is incredibly powerful but easy and intuitive to use. When you connect a computer to your RAD7, CAPTURE will look for and find it and then connect to it, all automatically. You can connect more than 20 RAD7s to your computer and CAPTURE will find them all and connect to every one of them.

If you want to download the data, just tell CAPTURE where you want to store it and CAPTURE will do the rest, automatically displaying the data unless you tell it not to.

In Chart Recorder mode, CAPTURE will display a picture of a paper chart recorder on the screen. The chart will be drawn on the 'paper' by a virtual pen as the data becomes available, and the paper will move slowly to the left as time passes. This is ideal to give your customer a dynamic picture of the radon level as your new mitigation system brings it down.

CAPTURE



Open Data File...



RAD7 2534

Add Device Options

Start RAD7 Test

Stop RAD7 Test

Test •

Data •

Setup •

Refresh Status

Chart Configuration •

Next reading: Run 1 Cycle 42 (2:03 AM, 0h 1m 17s)

Accumulated counts: 32 (A-9 B-0 C-13 D-7 O-4)

Prev. Reading: Run 1 Cycle 41

Radon Conc: 0.41 ± 24 pCi/L

Pump Current: 0 mA

Battery Voltage: 7.0 V

RAD7 Date: 9/9/17 2:02 AM

Calibration Date: 11/7/16

Air Temp: -2.0 °C

RH: 4.0%

Logging

Settings...

Open in New Window

Conc. Unit: Automatic

Temp. Unit: Automatic

Point Style: Normal

Line Weight: 2

☒ Show Grid Lines

☒ Show Chart Legend

View Range: Automatic

Hours: 8.30

Plot Lines:

☒ Radon

☐ Thoron

☐ Radon In Water

☐ Thoron In Water

☐ Air Temperature

☐ Water Temperature

☐ Relative Humidity

☒ RAD7 Printer Present

Download RAD7 Data

Chart Recorder

Issue RAD7 Command

Relay RAD7 Commands

2:02 AM

9/8/17 8:00 PM

9/8/17 10:00 PM

9/9/17 12:00 AM

222Rn pCi/L

Number of devices found: 1 (RAD7 2534 on usbserial-A502971P at 19200 Baud)

Scan for Devices

CAPTURE's Chart Recorder display showing an ongoing chart of radon level that has dropped to near zero over six hours.

The tried and tested RAD7

The RAD7 was invented and developed by Professor Lee Grodzins and his team at the Massachusetts Institute of Technology.

It uses electrostatic precipitation, where a high electrostatic field drives radon and thoron daughters onto the active surface of a solid state alpha detector. Alpha particles from further decays are counted and their energy measured. This allows the RAD7 to identify the individual isotopes of Po that decay on the detector surface.

This technology is what enables the RAD7 to have such a fast response without any massaging of the data. The original, raw data is available to the user any time. It permits the direct measurement of thoron and radon simultaneously and independently. It provides a rapid recovery from a high-radon measurement. It keeps the background virtually zero for the life of the instrument. These qualities have enabled DURRIDGE Company to produce a comprehensive suite of accessories for a wide range of applications and circumstances. You can find RAD7s on all seven continents and in all manner of academic, government and commercial institutions, from one-person radon mitigators to the EPA.

Over 4,500 RAD7s have been sold worldwide. The price is listed on the purchasing page of the web site, [<www.durridge.com>](http://www.durridge.com). Individual radon mitigators, home inspectors and radon testers qualify for a professional discount of 10% and an additional 5% prepayment discount for prepayment by cash, check or wire transfer, prior to shipping.

“We know that radon is the biggest source of natural radiation exposure and the biggest killer in the indoor environment. Radon is also a valuable naturally-occurring tracer used by oceanographers, atmospheric physicists, volcanologists and many others, and it is a pollutant of high-energy physics, dark matter research and semiconductor manufacturing. At the very least we need to be able to measure it accurately.”

Derek Lane-Smith, Ph.D.
Chief Technology Officer



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