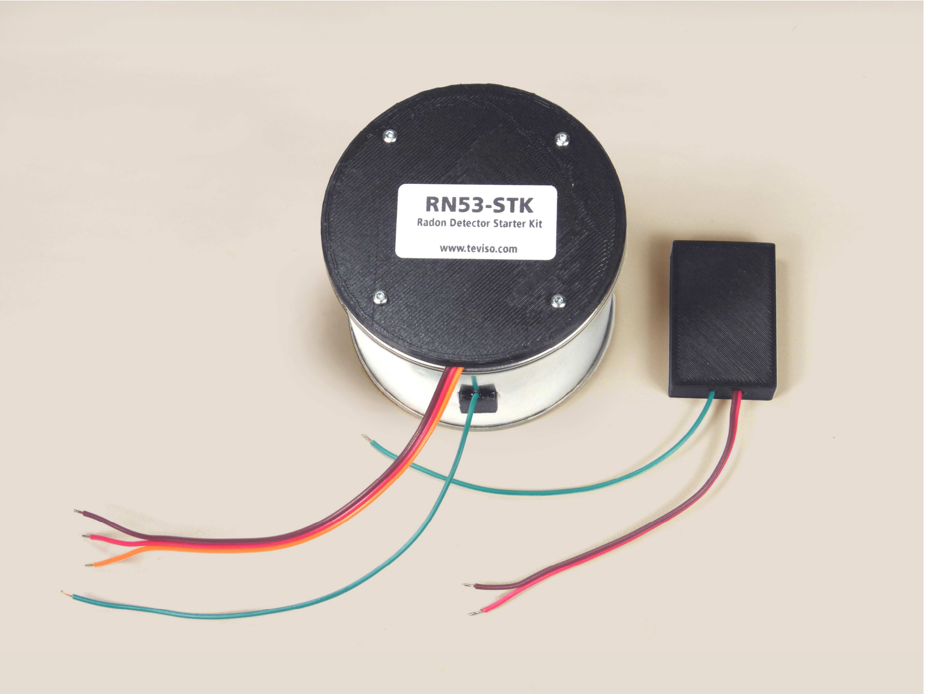


The RN53-STK Starter Kit has everything you need to kick-start your project and is a great tool

- **for developers:**
  Proof of concept prototypes as well as final commercial solutions.
- **for educational use:**
  Natural science courses and practical lab experiments.

The RN53-STK Starter Kit includes a RN53 Radon Detector, pre-installed in a measuring chamber, ready for a successful start.

The RN53-STK Starter Kit includes:

- one RN53 Radon Detector (preinstalled in the measuring chamber)
- one 170cm^3 measuring chamber
- one High Voltage Generator

Connections

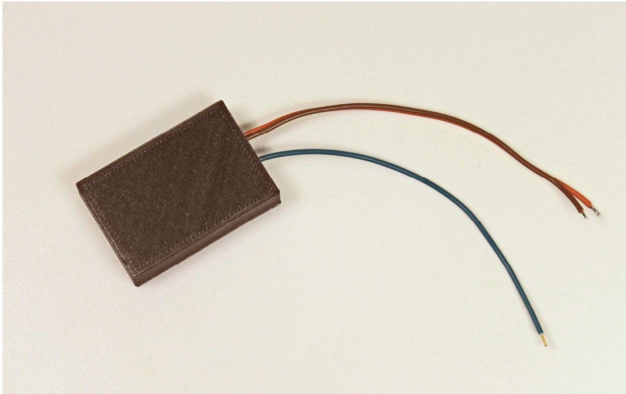
- Brown: GND
- Red: VCC
- Orange: Pulse Output
- Green: High Voltage Connection to Measuring Chamber

RN53 Radon Detector

At the heart of the RN53-STK Starter Kit is the RN53 Radon Detector. For a detailed overview of the features and characteristics of the RN53 Radon Detector, please refer to the RN53 Datasheet http://www.teviso.com/file/pdf/rn53-data-specification.pdf.

The RN53 Radon Detector, installed in the 170cm^3 measuring chamber with +400V voltage applied, generates 150 ±10% pulse counts per hour at 1000Bq/ m^3.

High Voltage Generator



The High Voltage Generator provides the high voltage for the measuring chamber.

Specifications

- Supply Voltage VCC: +3.0V - +6.5V
- Supply Current: <7µA
- High Voltage Output: +400V

Connections

- Brown: GND
- Red: VCC
- Green: High Voltage Output

Important Advice on Use

Though there is already a 5.1MΩ resistor inside the HV generator, avoid discharging simply by connecting HV and GND pins as it could produce sparks, which can subsequently result in surges and damage CMOS components inside the generator module.

The HV generator is preset to 400V. In order to measure the voltage properly you need a 1GΩ resistor probe. Conventional multimeters, which have an internal resistance of approx 10MΩ, will influence the measurement and result in much lower readings.

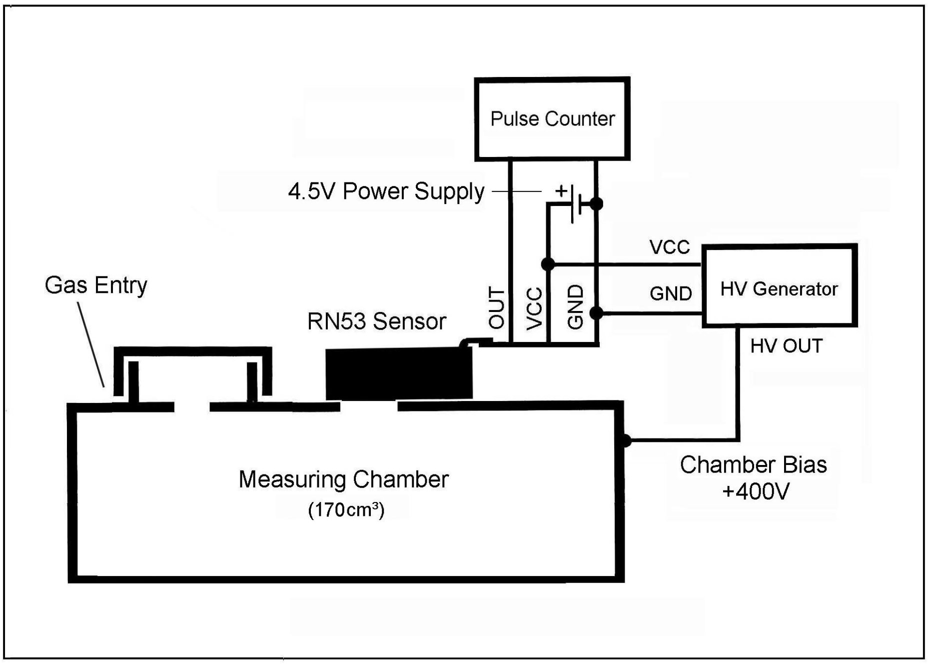
Electromagnetic Interference (EMI)

In situations of an environment with high electromagnetic interference a capacitor (10nF, 1kV) between HV OUT and GND will prevent false output pulses of the RN53 sensor.

CAUTION!
If you want to discharge the capacitor when disconnected from power source use a 4.7MΩ resistor between HV and GND pins. Take care when discharging - to avoid shock, hold the 4.7MΩ resistor only with well isolated tool and never by hand.

Application Notes

Connecting the Components of an Experimental Radon Monitor



Technical Details

- Measuring Chamber Volume:170cm³
- Radon Sensor RN53 Power Requirements: V_{in}: 4.5V/20µA
- High Voltage Generator Output: +400V
- Power Supply for RN53 Sensor and HV Generator: 3x 1.5V Type AA battery
- Battery Service Life: 3 years of uninterrupted operation
- Measurement Sensitivity: 150 ±10% counts per hour at 1000Bq/m^3

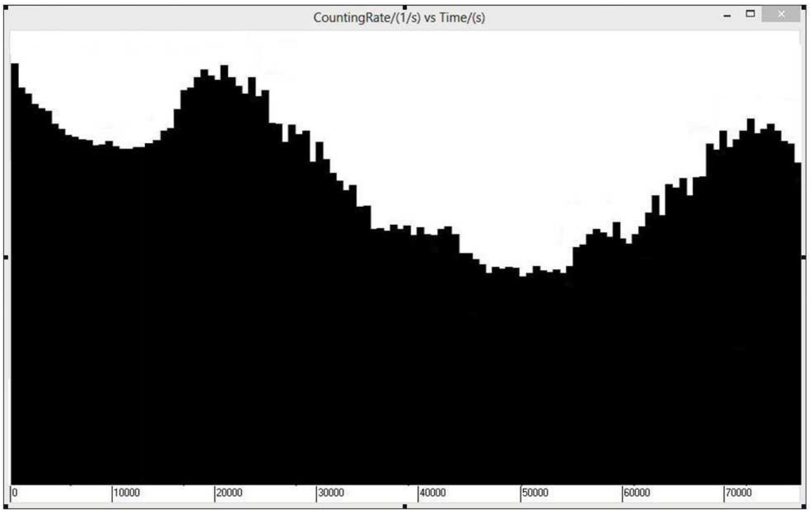
Experimental Radon Source

For a fast functional test of the Radon Starter Kit RN53-STK an experimental radon gas chamber my be used. https://www.teviso.com/file/pdf/experimental-radon-source.pdf

Measuring Radon

After starting a measurement in a new environment, the full precision is reached after a settling time of 48 hours. Sampling intervals of one hour are recommended.

Because radon concentrations can vary seasonally, it is best practice to monitor radon levels over a long period of time. Ideally, this would be one full year because this allows you to determine the annual average radon concentration in a particular dwelling room.



Radon concentration monitored over a period of 48 hours in a room in the basement of the building

About Radon

Radon (^{222}Rn) is a colorless, odorless and tasteless gas that is radioactive. ^{222}Rn is produced by the radioactive decay of radium (^{226}Ra), which is found worldwide in uranium ores, phosphate rock, shale, metamorphic rocks such as granite. The density of ^{222}Rn is ten times higher than air.

^{222}Rn belongs to the radium (^{226}Ra) and uranium (^{238}U) decay chain, and has a half-life of 3.82 days. Its four first decay products (excluding marginal decay schemes) are very short-lived, meaning that the corresponding disintegrations are indicative of the initial radon distribution. Its decay goes through the following sequence:

- ^{222}Rn, 3.82 days, alpha decaying to...
- **^{218}Po, 3.10 minutes, alpha decaying** to...
- ^{214}Pb, 26.8 minutes, beta decaying to...
- ^{214}Bi, 19.9 minutes, beta decaying to...
- **^{214}Po, 0.1643 ms, alpha decaying** to...
- ^{210}Pb, 22.3 years, beta decaying to...
- ^{210}Bi, 5.013 days, beta decaying to...
- ^{210}Po, 138.376 days, alpha decaying to...
- ^{206}Pb, stable.

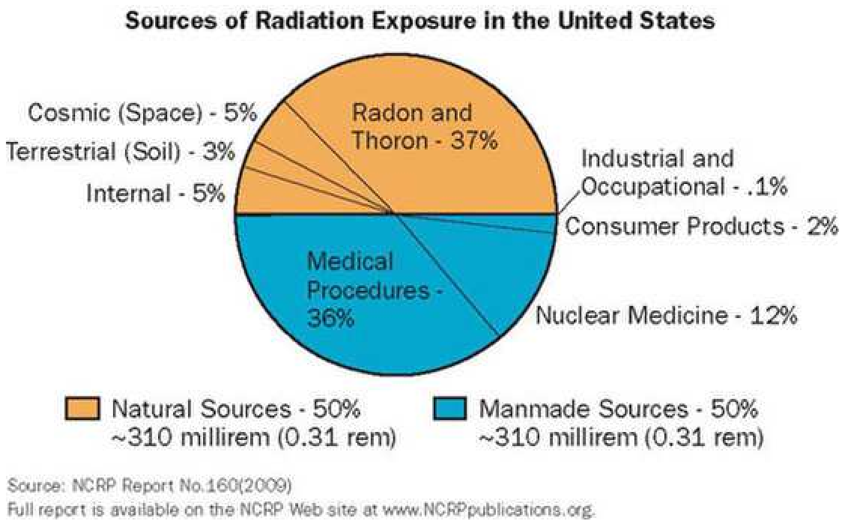
Radon in Daily Life

Radon is a major contributor to the natural radioactivity of the atmosphere near the earth's surface. With its half-life of 3.82 days it has plenty of time to diffuse through small cracks in rocks and through the soil and to enter the atmosphere.

Some level of radon will be found in all homes. Radon exposure in homes and offices may arise from certain subsurface rock formations, and also from certain building materials (e.g. granite). The greatest risk of radon exposure arises in buildings that are airtight, insufficiently ventilated, and having leaks, openings or cracks, that allow radon-containing air from the ground into basements and dwelling rooms.

Radon concentration varies greatly with season and atmospheric conditions. In the same location it may differ by a factor of two over a period of 1 hour. Also, the concentration in one room of a building may be significantly different from the concentration in another.

Radon has been considered the second leading cause of lung cancer and the leading environmental cause of cancer mortality. According to WHO recommendations the average annual radon concentration should not exceed 300 Bq/m³ in the normal occupancy area in order to avoid adverse health effects.



Reference
[1] http://www.who.int/ionizing_radiation/env/radon/en/

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