QUARTEX RD1503 GEIGER COUNTER

TECHNICAL DATA

PRINCIPLE

The Geiger Counter Quartex RD1503 detects Beta particles, X- and Gamma rays (called ionizing rays) with great sensibility.

Each ionizing ray that crosses the GEIGER-MULLER tube ionizes a special mixture of gas included in the tube. The tube is under high voltage and each ionization generates an electric pulse. The device counts pulses to evaluate the radioactivity.

An integrated circuit chip transforms the number of pulses in "quantity of rays energies" transmitted to the human body by unit of time**, the dose equivalent**. This chip directly controls the LCD dot matrix to indicate the measured value.

To control the good functioning of the counter and to detect a punctual radioactive source a beep is emitted for each ionization in the tube. An increase of beep frequency indicates the proximity of a radioactive object. The beep can be disabled. Three different alarm levels can be selected.

FUNCTIONING

To start the radiometer, just push the main button. That is the only thing to do, no adjustment is necessary, the use is very simple!

At start up, a long beep will indicate the beginning of the counting cycle. Then begins the start of the counting cycle, when a beep sounds, the display shows the symbol ■ for each ionization detected. After ten seconds, the display shows the first step in µRem or µ Sievert per hour depending on the selected mode. The most reliable measure is obtained after a first cycle of 40 seconds of counting.

CHARACTERISTICS

Body:	Mass colored plastic
Display:	LCD dot matrix
Language	French
Color:	Grey
Weight:	0.09 kg without battery
Size:	105mm X 60mm X 26 mm
Ionizing radiation detected:	X-rays, Gamma-rays and Beta particles
Cycle of measurement:	40 seconds
Measurement result display time:	Continuous
Unity of measurement:	Micro Rem/hour (μRem/h) or micro Sievert/h (μSv/h)
Sensor:	Geiger-Müller tube
Display:	4 digits + cycles symbols
Measurement range in μRem/h:	0 to 999 μRem/h
Measurement range in μSv/h:	0 to 9.99 μSv/h
Alarm thresholds	- in μRem/h 30, 60, 120
	- in μSv/h 0.3, 0.6, 1.2
Energy of X- and Gamma rays detected:	100 KeV to 1.25 MeV
Energy of Beta particles detected:	350 keV to 1.5 MeV
Measurement uncertainty for X- or γ-rays :	± 15 % +6/D*
Beta particles detected	Depending on source shape
Measurement uncertainty for β particles:	> 20% of the fluence above 350 KeV
Life duration:	At least 5 years (> 2.10^{10} pulses)
Power supply:	One or two AAA type batteries
Autonomy	550h
Temperature range:	-20°C to +50°C
Temperature range for storage:	+5°C to +40°C
Individual factory-calibration:	Cesium 137 at 500 μRem/h
Display of each X, γ or β quantum:	■ on LCD
Battery reverse mounting:	Non destructive

* : (With confidence probability of 95%), where D is the dose rate in μSv/h
For low energies, below 300 keV, the unit is more sensitive (up to 125%) nevertheless radioactive objects emit much more radiation of high energy than low energy

CERTIFICATION

The former version of the Radex called Quartex (version with the same GM tube and openings for Beta sensitivity) has been certified for the metrology by **VERITAS-LCIE** lab (French Central Laboratory for Electric Industries).
The LCIE is accredited by the BNM FRETAC (National Bureau of Measurement)
The FRETAC has approved the agreement of the WEEC (Western European Calibration Cooperation).
The certificate (in French language) can be provided upon request but requires a high scientific background.

OVERALL OF THE VERITAS-LCIE REPORT:

The results of this report are the following:

With low energies like with 137 keV X rays, the output is important. This is due to a light shielding of the tube to benefit from Beta detection.

Above 300 keV, the response is "flat" and the accuracy better than 25% for full scale of rays (from 100 μR/h to 825 μR/h).

For Beta particles, the test has been performed with a strontium 90 source. This source has a very low energy. The Beta particles are subdued by the plastic surface of the body that is in front of the tube (slit). For particles with energy of 350 keV, 25% of the flux goes through the slits and the tube. This attenuation decreases with the growing of Beta particles energies.

After the evaluation, VERITAS-LCIE has recommended to use the micro Rem instead of the micro Roentgen. This recommendation for Rem in H*(10) allows to slightly compensate the response of the tube in the range of low energies.

CEA EVALUATION

An additional evaluation has been performed by the **French Nuclear Agency** (CEA) with various Gamma sources and a "pure" Beta source.

This evaluation shows that the performance of the QUARTEX is similar to or even better than that of professional GEIGER counters which are twenty times more expensive.

- The performances for very low energies (Americium: 59,5 KeV) show that the sensibility is higher than for the professional FH 40 type Geiger counter model when the Babyline Geiger counter model doesn't detect anything. This high sensibility is the result of a compromise between detecting Gamma and Beta rays.

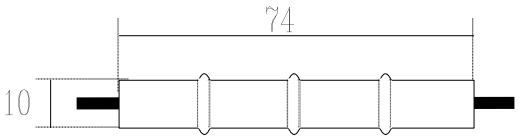
- The performances in the range of regular energies (from 100 KeV to 1,33 MeV) show that they are similar to professional Geiger counters used as references.

- The performances in Beta are similar to those of the Babyline (except saturation level) when the FH 40 doesn't detect anything.

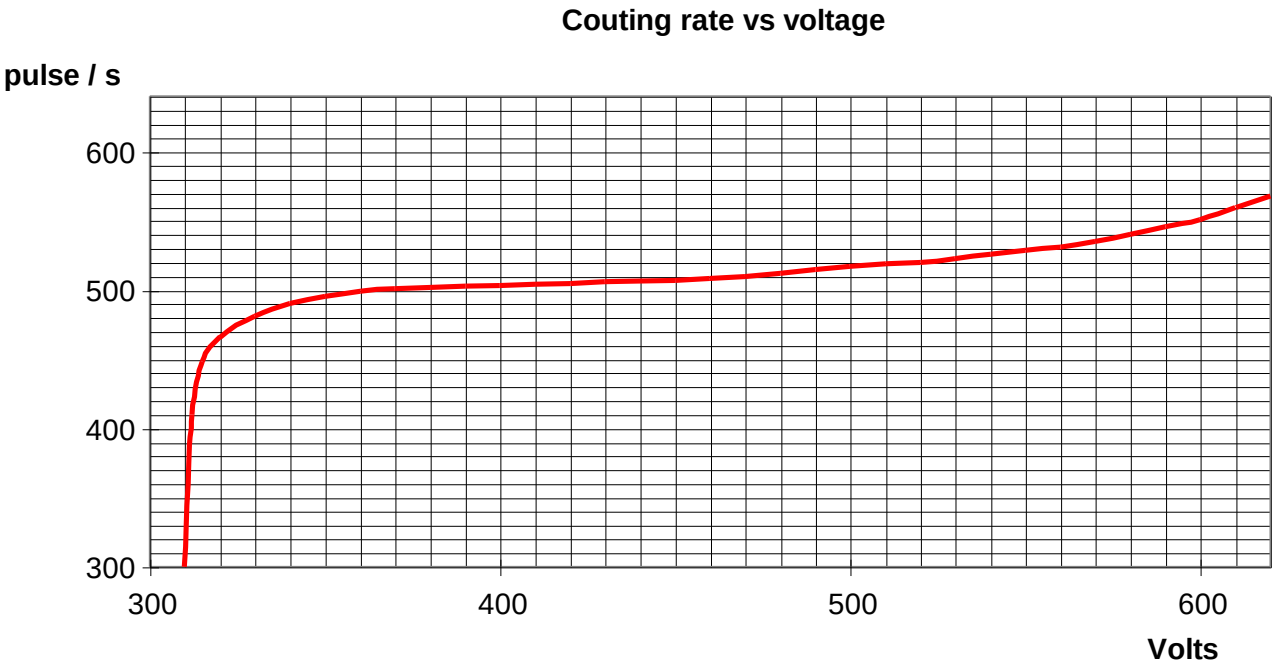
TECHNICAL CHARACTERISTICS OF THE

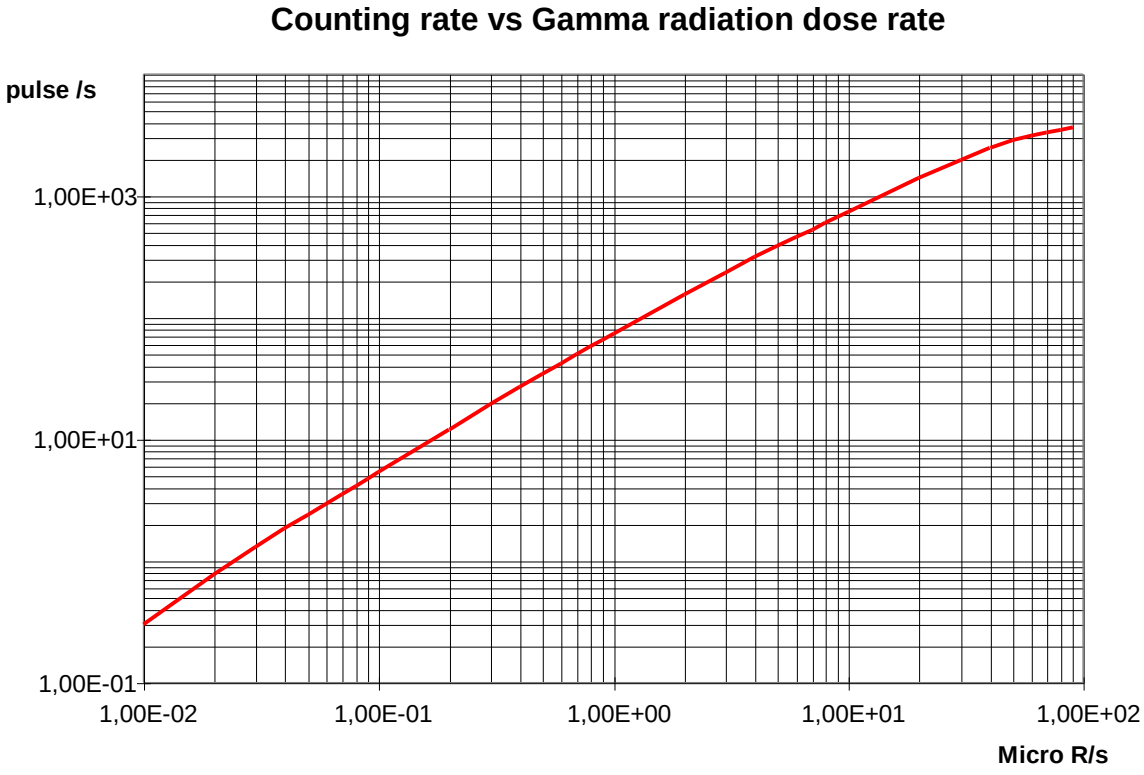
GEIGER-MULLER CBM 20-1 TUBE

USED IN THE QUARTEX RD 1503JP RADIOMETER

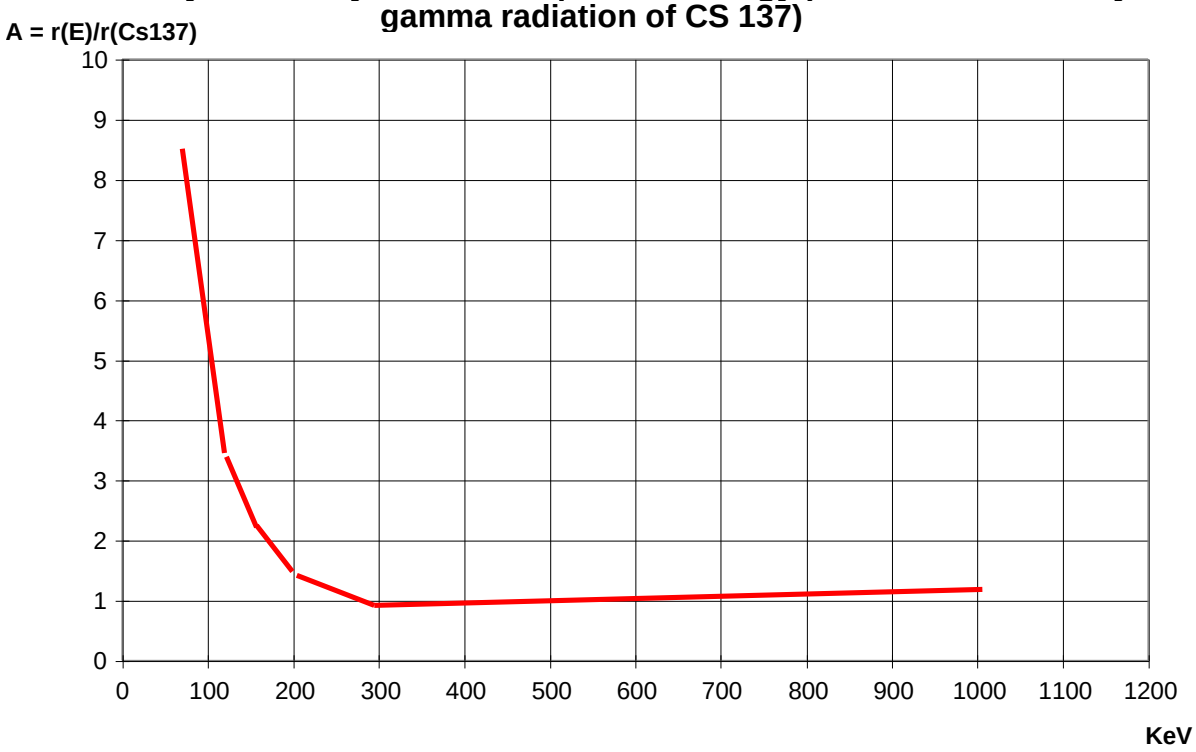


length of the sensible part of the tube	62 mm
Mass of the tube	10 g
Filling gas	Ne - Br_2 - Ar
Filter	Stainless steel
Filter thick	50 µm
filter density	40 mg / cm^2
Temperature range	-60 à +70°C
External pressure	Up to 1,5 kg / cm^2
Number of stiffening rings	3
Dose rate range of detected gamma radiation	4.10 $^{-3}$µR/h to 4.10 ^{1}µR/h
Operating voltage range	350 V à 475 V
Recommended operation voltage	400 V
Voltage plateau length	100 V
Initial voltage	260 V to 320 V
Plateau slope	0,1% / V
Cobalt 60 pulse Gamma sensitivity	78 pulse / µR
Inherent background	0,5 pulse per second
Dead time at 00 V	190 µs
Detected gamma radiation energies	0,054 MeV à 1,25 MeV
Life duration	> 2.10 ^{10} pulses
Inter electrode capacitance	4,2 pF
Cathode surface density	50 mg / cm^2

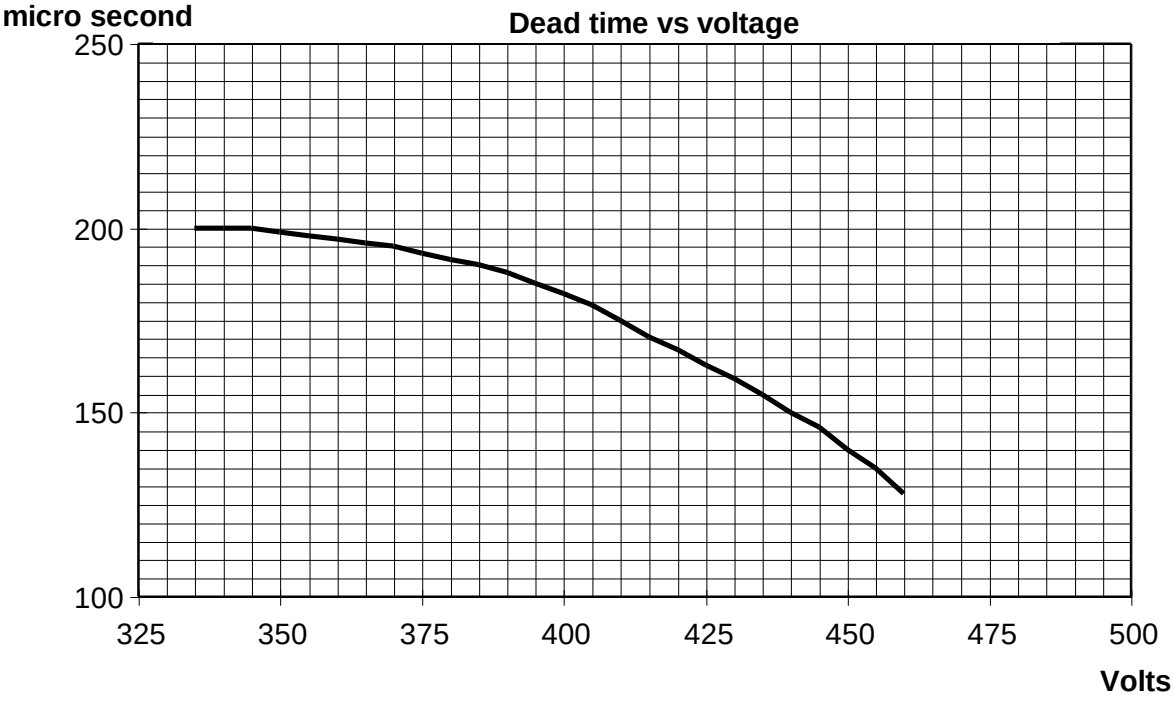


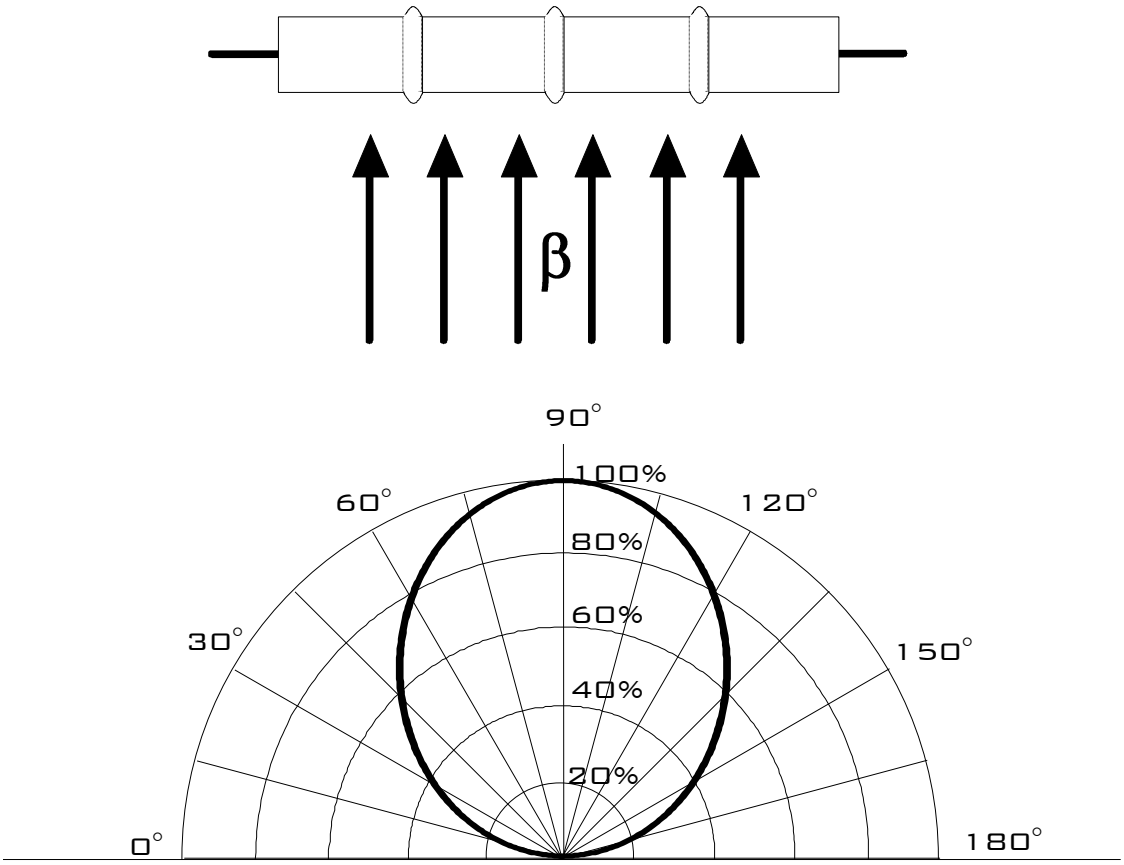


Gamma ray sensitivity vs Gamma quantum energy (relative to sensitivity for gamma radiation of CS 137)



Dead time vs voltage





Sensitivity vs angle of incidence of Beta radiation