Instruction

RaySafe 452 Calibration Check

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Content

Introduction

This document describes a procedure that can be used to perform calibration checks on a RaySafe 452 survey meter. The purpose is to verify that the instrument's calibration stays within specified limits.

The calibration check is based on the idea of a constancy measurement – a repeatable measurement procedure, generating test values that can be compared against a previously established reference value.

Required material

- RaySafe 452, with the *Ambient* lid[1),2)] attached
- Check the source – please see section 4 for further details

Instructions

Each calibration check, including the initial reference measurement, consists of the two specific tests described below.

First establish your reference values by performing both tests, as soon as possible after receiving a newly calibrated RaySafe 452. Write the measurement values in the "Measurement log" on page 6.

Any time you wish to verify accuracy, perform the two tests again and compare the test values against your reference values.

Test 1

1. Place the instrument flat on a table, with the sensor area pointing down
2. Place the check source flat on the instrument's display, edge-to-edge at "6 o'clock"
3. Wait for 10 seconds, then read the dose rate value on the display

Test 2

1. Place the instrument so that the sensor/lid area is accessible
2. Place the check source flat against the lid, edge-to-edge at "12 o'clock"
3. Wait for 10 seconds, then read the dose rate value on the display

1) The Air Kerma lid can be used too, as long as the same lid is used for each test.
2) Use the same specific lid every time – do not exchange with another lid, even if it is the same model.

Notes about the check source

Recommendation

These tests are designed for a ^{137}Cs planchet check source, 1 inch diameter, with an activity of 10 µCi (370 kBq). ^{137}Cs has a half-life of around 30.17 years.

Check source impact on constancy measurements

Different check sources may have different activity levels due to aging – be sure to use the same check source every time!

Even when using the same check source, e.g. ^{137}Cs, the half-life is short enough to have a measurable impact on your constancy measurements. For every year, the check source activity will have decreased by about 2.27%[3)].

If significant time (e.g. more than a year) has passed since the reference measurements, the reference values may be compensated for check source aging, using the following formula:

$H_{comp}=H_{ref}\times(1-0.02271)^t$,

Where H_{comp} is the compensated reference value, H_{ref} is the original reference value, and t is years passed since the reference measurements.

Test results and deviation

Deviation in percentage can be calculated for each test using the formula below:

Deviation [%]= $100\times(H_{test}/H_{ref}-1)$,

Where H_{ref} is your reference measurement, and H_{test} is your test measurement.

As noted above, if significant time has passed since reference measurements, the reference values may be compensated for check source aging. Substitute H_{ref} with H_{comp}:

Deviation [%]= $100\times(H_{test}/H_{comp}-1)=100\times(H_{test}/(H_{ref}\times(1-0.02271)^t)-1)$

Acceptance

Deviation should stay within 20% of the reference measurement. If deviation is larger, a full calibration is recommended. Even if the device passes the calibration check requirements, a full calibration is recommended every 2 years.

Please contact your RaySafe representative for further instructions.

3) This is valid for ^{137}Cs – different numbers will apply for other nuclides.

Measurement log

Instrument serial number	Check source ID

Reference Measurements

Date	Test performed by	Dose rate, Test 1	Dose rate, Test 2

Calibration Control Measurements

Date	Test performed by	Dose rate, Test 1	Deviation [%]	Dose rate, Test 2	Deviation [%]