User Manual R1.0
Santacary Technology Co. Ltd.
MHK-G80 Geiger Muller Counter and UVAB light meter

INTRODUCTION

Congratulations on your purchase of this Santacary MHK-G80 Geiger Muller counter and UVAB light meter. MHK-G80 has an internal Geiger Mueller tube to detect ionizing radiation and ultraviolet sensor to measure ultraviolet UVAB radiation.
It can be used as education, industrial, food, agriculture, commercial maintenance, research, and other analytical or scientific applications in areas such as home, industrial plants, public utilities, universities, and laboratories. It can be used for ionizing radiation and UVAB light detection both indoor and outdoor, as well as in other similar environments.

FEATURES

- ✧ Install Geiger Muller tube to detect ionizing radiation.
- ✧ Apply Gallium Nitride Based Material Photovoltaic sensor to detect UVAB light
- ✧ Detect ionizing radiation such as Beta, Gamma, X-Ray.
- ✧ Range of dose rate is 0.00~1000.00 µSv/h, 0.00~100.00 mR/h
- ✧ Detectable Energy Range is 0.1~1 MeV.
- ✧ Support Timed Count mode.
- ✧ Support a data log function that provides up to 8 hours history of ionizing radiation level in Graphic Display.
- ✧ Numeric Display contains ionizing radiation level reading in CPM, radiation level in µSv/h or mR/h, average CPM and µSv/h of a specific time frame, total count since power on, and ionizing radiation level (Normal/Medium/High).

- ✧ Display UVI, and UVAB ultraviolet radiation intensity simultaneously
- ✧ Display Type: 2.2" TFT Display

NOTE:

Do not place the meter inside a microwave oven as it can damage the unit. This meter is for detecting ionizing radiation such as alpha, beta, gamma, and x-rays. It will not detect non-ionizing radiation such as microwave emissions.

DEVICE

1. UVAB light sensor
2. TFT display
3. Power button
4. Select button
5. Enter button
6. Battery compartment cover

PRINCIPLES OF OPERATION

MHK-G80 Geiger Counter installed Geiger Muller tube to detect ionizing radiation. When the ionizing radiation passes through the Geiger tube, it triggers electrical pulses for the device to register as count. The basic count rate unit is CPM (Count Per Minute). The CPM count rate indicates the ionizing radiation level and it can be converted to a other traditional radiation units, such as µSv/h or mR/h.

After unit turns on for one minute, it will show the background ionizing radiation reading. The background ionizing radiation reading (in CPM) indicates the nature ionizing radiation detected at that minute. This reading may change from time to time and location to location. To get accurate reading, user may need to get an average value over a longer time period.

CPM and Total counts are the most direct methods of measurement. µSv/h, µR/h, and mR/h are calculated using a conversion factor optimized for Co60.

OPERATING INSTRUCTIONS

1. Power On/Off

Press the Power button shortly to power on and press the Power button for 2 seconds to power off.

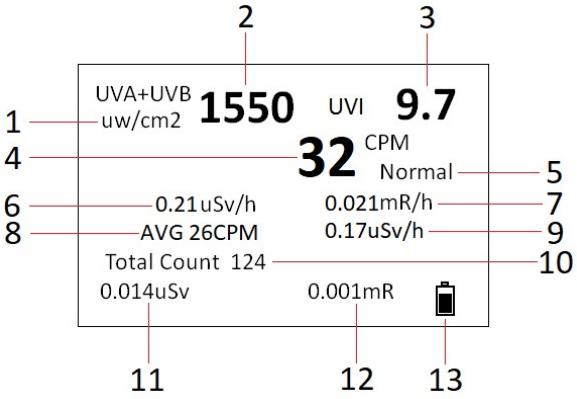
When the meter is first power on, it performs 2 seconds countdown for meter stable and initialization. When complete, the unit is ready to use. Users should see the current UVI, and UV (UVA+UVB) ultraviolet radiation intensity readings on the top line. Then are the background CPM rate in absence of an ionizing radioactive source after one minute or until the reading has stabilized.

2. Display Modes

There are two display modes for review the measurement information: Numeric and Graphic. Press Power button to switch the two display modes.

2.1 Numeric Display

The numeric display is updated every two second. The top line display UVI, and ultraviolet (UVAB) radiation intensity readings. For Geiger Muller counter, 8 numeric dose rates and count are displayed: current ionizing radiation level reading in CPM, current ionizing radiation level in µSv/h and mR/h, average CPM and µSv/h, total count, µSv and mR since power on or reset, and current ionizing radiation level (Normal/Medium/High) as shown in below.



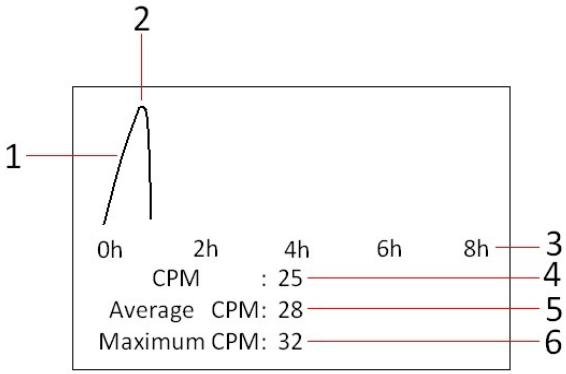
1. UVAB Radiation intensity unit
2. UVAB radiation intensity
3. UVI (Ultraviolet Index)
4. Current ionizing radiation level reading in CPM
5. Current ionizing radiation level (Normal/Medium/High)
6. Current ionizing radiation level in µSv/h
7. Current ionizing radiation level in mR/h
8. Average CPM of a specific time frame
9. Average µSv/h of a specific time frame
10. Total count since power on or reset
11. Total µSv since power on or reset
12. Total mR since power on or reset
13. Battery gauge

2.2 Graphic Display

MHK-G80 has a data log function that provides up to 8 hours history of ionizing radiation level in Graphic Display. The data logging frequency is 10 minutes.

The graphic chart displays the past readings for CPM intensity. The time per division (indicates the chart's time per unit division) is 10 min / div.

Graphic chart contains a maximum of 49 recorded data at one time. The time span is 8 hours. After the chart is full, the data is FIFO (first-in, first-out). The graphic display includes:



1. Curve of CPM ionizing radiation intensity
2. The highest point on curve of CPM ionizing radiation intensity (The higher the curve, the greater the value)
3. Time scale (farther to the right, longer time in the past)
4. Current value of CPM intensity
5. Average value on the chart of CPM intensity
6. Maximum value on the chart of CPM intensity

3. Response Time

Numeric display updates every 2 seconds. At low background levels, the update is the average for the past 32-second time period. The timed period for the average decreases as the ionizing radiation level increases. Detail is shown in table 1.

Table 1

Ionizing radiation level after 32 second start-up	**Averaging Periods**

<6000 CPM or <39.7 μSv/h	30 seconds
6000-12,000 CPM or 39.7-79.5 μSv/h	6 seconds
>12.000 CPM or > 79.5 μSv/h	4 seconds

4. Alarm Threshold

The preset alarm threshold for dose rate is 1.0 μSv/h and for accumulated dose is 20 mSv. These preset points are factory set and cannot be changed.

The audio alarm will be triggered once the ionizing radiation level reaches any of the preset alarm thresholds until the alarm is deactivated, or the ionizing radiation level drops below the preset alarm threshold. The audio alarm will sound at 2 beeps/sec. Press any button to mute the alarm.

5. Start a Timed Count

5.1. Time Count Durations

A timed count is useful for determining the average CPM over a longer period of time. The number of counts detected by the meter varies from minute to minute due to the random nature of radioactivity. When a count is taken over a longer period, the average count per minute is more accurate.

Taking an average allows users to detect low-level contamination or differences in background ionizing radiation due to altitude or soil mineral content. For example, if one 10-minute average is 1 CPM higher than another 10-minute average, the increase is likely due to normal variation. But over 12 hours, a 1 CPM increase over the 12 hours background average may be statistically significant.

There are 5 preset timed count durations from menu for selection: 1 minutes, 10 minutes, 100 minutes, 12 Hours and 24 Hours.

To accurately interpret the readings user get on the meter, it is good to establish the normal background ionizing radiation count rate for each

area user plan to monitor. A 10-minute average is moderately accurate. To establish a more accurate average, take a 100 minutes timed count. If user need to determine whether there is prior contamination, take averages in several locations, and compare the averages.

5.2. Steps to take a Timed Count

1) Press Select button SELECT shortly to start a Timed Count.
2) Elapsed time is shown since Timed Count started.
3) The Timed Count can be cancelled anytime. Press Select button SELECT shortly to cancel current Timed Count.

6. Menu operations

By pressing the Enter button ENTER shortly, the meter enters into Menu operation. There are five menu items by pressing the Enter button ENTER shortly to scroll: audio clicks, alarm, reset total count, set timed count duration, and exit. The menu operations are described in table 2.

Table 2 Menu Operations

Menu Items	Description and Operation
Audio Clicks	To switch between audio clicks and no audio clicks with each count collected by the Geiger Muller tube. 1) Press Select button SELECT shortly to switch between silent and audio operation: On/Off. 2) Press the Power button shortly to confirm and exit the menu operations. Or pressing the Enter button ENTER shortly to proceed to the next menu item.
Alarm	When alarm is activated, the audio alarm will be triggered once the ionizing radiation level reaches

	the preset alarm thresholds. 1) Press Select button SELECT shortly to switch between activate or deactivate alarm: On/Off. 2) Press the Power button shortly to confirm and exit the menu operations. Or pressing the Enter button ENTER shortly to proceed to the next menu item.
Reset Total Count	Press Power button or Select button SELECT shortly to clear the total count and exit the menu operations. Or press the Enter button ENTER shortly to ignore and proceed to the next menu item.
Set Timed Count Duration	There are 5 preset durations from menu: 1 minutes, 10 minutes, 100 minutes, 12 Hours and 24 Hours. 1) Press Select button SELECT shortly to switch preset durations: 1 minutes, 10 minutes, 100 minutes, 12 Hours and 24 Hours. 2) Press Power button shortly to confirm and exit the menu operations. Or press the Enter button ENTER shortly to proceed to the next menu item.
Exit	1) Press Power button or Select button SELECT shortly to exit the MENU operation. 2) Or press the Enter button ENTER shortly to loop back to the first menu item: Audio Clicks.

BACKGROUND SAFE LEVELS

Table 3 Suggested background ionizing radiation readings levels:

Background safe levels	Average measurement value in Timed Count Duration	Action
Safe level	⩽50CPM or ⩽0.33μSv/h	No worry at all.
Attention level	51CPM~99CPM or 0.34μSv/h~0.66μSv/h	Users need to identify additional sources of ionizing radiation
Warning level	⩾100CPM or ⩾0.66μSv/h	Do not stay in this area for long period

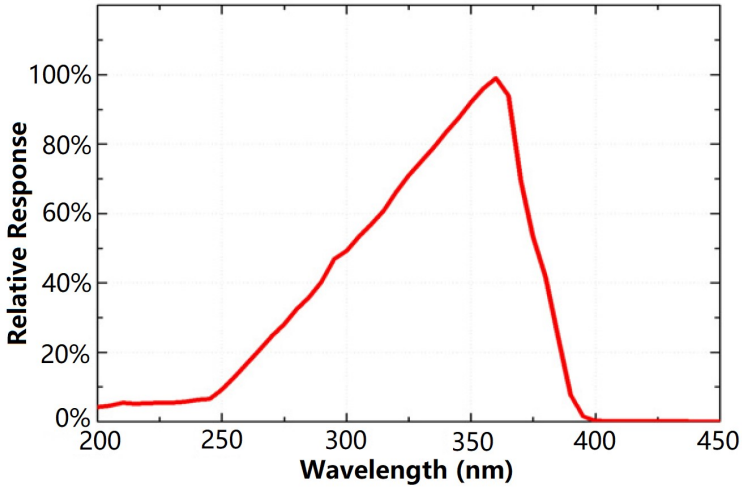
ULTRAVIOLET INDEX (UVI)

This meter displays the Ultraviolet Index (UVI) in Normal Display. Table 4 lists the risk of UVI.

Table 4 UVI risk

UVI	0-2.9	3.0-5.9	6.0~7.9	8.0~10.9	11+
Description	Low danger from the sun's UV rays for the average person	Moderate risk of harm from unprotected sun exposure	High risk of harm from unprotected sun exposure	Very high risk of harm from unprotected sun exposure	Extreme risk of harm from unprotected sun exposure

SPECTRAL RESPONSE OF UVAB



SPECIFICATIONS

Geiger Counter Specifications

Ionizing radiation detection	Beta, Gamma, X-Ray
Range of dose rate	0.01 ~ 1000.00μSv/h
	0.00 ~ 100.00 mR/h
Detectable Energy Range	0.1~1.0 MeV
Accuracy	±15%
Own Background	0.4 pulses/s

Maximum Dose Reading	99,999,999.99 µSv or 9,999,999.99 mR

UV Specification

UVAB Measurement Range	0 to 50,000 µW/cm2 (50 mW/cm2)
UVI Measurement Range	0 to 130
Spectral Detection Range	240 to 395 nm
Peak point	360nm
Measurement accuracy	±4% or ±1 digits
Resolution	1.0 µW/cm2
Temperature Range	-10 to 50°C (14 to 122°F)
Humidity Range	0 to 90%RH

General

Environment	Indoor or outdoor
Display	2.2" TFT LCD
Operating	14°F to 122°F (-10°C to 50°C), 0~90% RH non-condensing
Storage	14°F to 140°F (-10°C to 60°C), 0~80% RH non-condensing
Power Supply	Three AA Alkaline Batteries
Dimensions	74x148x28mm (2.91x5.83x1.1")
Weight	145 grams (5.11 oz.) without batteries

PACKAGE INCLUDED

- ✧ Santacary MHK-G80 Geiger Muller Counter and UVAB light meter
- ✧ Carry case
- ✧ English User Manual

CLEANING AND STORAGE

The front panel and case can be cleaned carefully with a soft wet cloth. Allow drying completely before using. Do not use aromatic hydrocarbons or chlorinated solvents for cleaning.
Do not store the instrument where temperature or humidity is excessively high.

BATTERIES REPLACEMENT

1. When the batteries power is low, the low voltage symbol  appears on the display. It indicates that the batteries need to be replaced. If they are not replaced in time, the accuracy of measurement will be affected.
2. Open the battery compartment cover and take out the batteries.
3. Install 3 new AA batteries correctly according to the diagram of positive and negative poles in the battery compartment.
4. If the meter is not used for a long time, please take out the batteries to prevent the batteries from leaking and damaging the meter.

GENERAL MAINTENANCE TIPS

1. Be sure to store the unit inside the carrying case when not in use.
2. If user is planning to store the unit for a long time, remove the

batteries to avoid battery corrosion inside the battery compartment.

3. Do not place the unit inside a microwave oven as it can damage the unit and/or the microwave. This meter is for detecting ionizing radiation such as beta, gamma, and x-rays. It will not detect non-ionizing radiation such as microwave and radio emissions.

WARRANTY

The MHK-G80 is warranted to be free from defects in material and workmanship for a period of two year from the date of purchase. This warranty covers normal operation and does not cover misuse, abuse, alteration, neglect, improper maintenance.

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