

ScienceCube



# Wireless Light/RGB(Color)/UV (WL112LC) User Guide



Rev. WL112LC-12-2023

**This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.**

 **KOREADIGITAL**

*The Science Cube wireless Light/RGB/UV sensor measures the intensity of various wavelengths from visible light to ultraviolet light.*

**The wireless Light/RGB/UV sensors** is a sensor that can conduct experiments related to optics by measuring wavelengths from the visible light range to the ultraviolet range. Ultraviolet index (UVI), RGB, and illuminance can be easily changed using buttons. Additionally, the sensor has a display window so you can immediately check the measured values, and measurements can be made by remotely connecting to a smart device or PC wirelessly or wired without an interface.

## **Suggested experiments**

- Light intensity depending on distance.
- The brightness of the bulb depends on the battery.
- Light synthesis experiment.
- UV protection principle experiment

## **Composition**

*The ScienceCube wireless Light/RGB/UV sensor consists of the following.*

- Wireless Light/RGB(Color)/UV sensor(WL112LC)
- USB-A/C cable
- Booklet

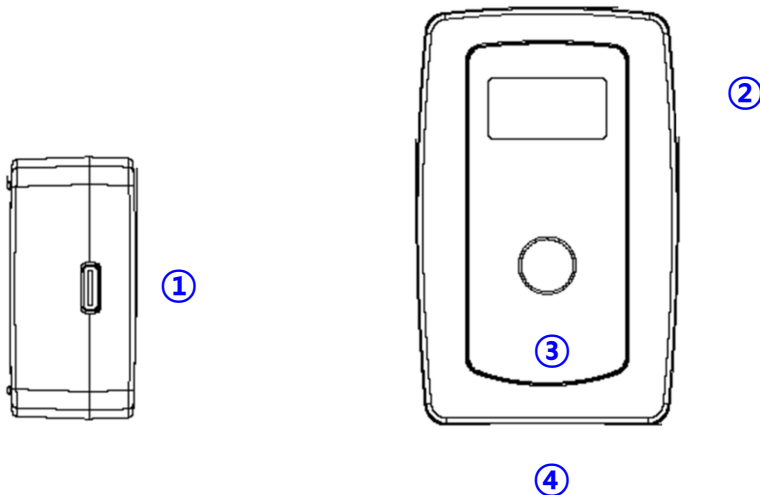
## Feature

- Up to four Science Cube wireless sensors can be connected to a PC or smart device at the same time.
- It supports dual-mode Bluetooth, allowing you to connect not only smart devices but also desktop and laptop PCs to conduct experiments using the **Science#** application.
- It can be connected to a PC through a USB port and experiments can be performed using the **Science#** program.



## Function of wireless sensor

### Structure



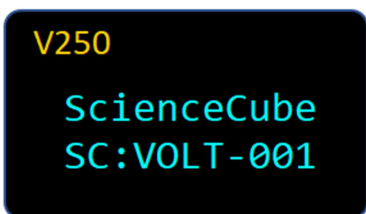
- ① USB port : Connect the sensor to a PC and use it for experiments or charging.
- ② OLED Display : Displays measured sensor values, sensor type, sensor ID, and remaining battery level.
- ③ Power/Function Button : It has functions such as power ON/OFF, measurement sensor change and calibration, etc.
- ④ Sensing part : A place to measure ultraviolet rays (UV), RGB, and illuminance.

**Caution** : Do not use the sensor near fire or explosive gases. Chemical vapors can block the polymer layer used for capacitance, causing permanent damage to the sensor.

### Power/Function Button

Status	Turn	Action	Description
When the power is off	Click once	■	A short press turns the sensor on.
	Long click	■■■■■	A long press changes the mode and turns on the sensor.
When it's on	Click once	■	Change sensor type or range. (Multi-sensor or range sensor only)
	Long click	■■■■■	Turns off.

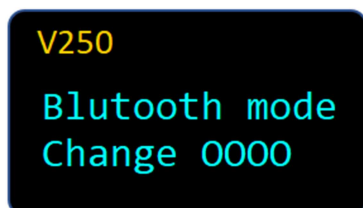
### Start screen



V250 : Displays the sensor's firmware version.

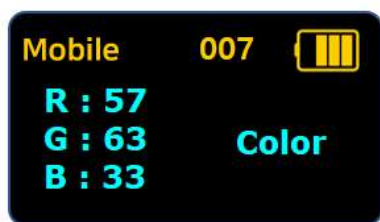
SC:OOOO-001 : When you search for a Bluetooth device, the device name will be displayed. (Sensor name and 3-digit serial number)

## Mode change



When you press and hold the power button and turn it on, the Bluetooth connection mode changes to **Mobile** or **PC** with the following message.

## Measurement screen



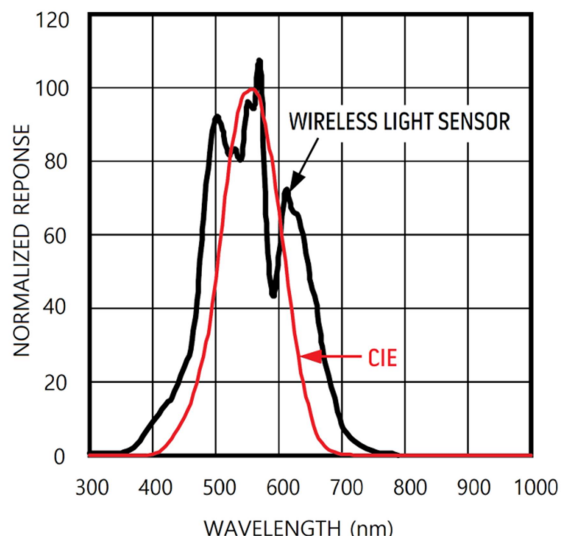
① Connection mode	<b>Mobile</b> : Connecting Android or iOS. <b>PC</b> : Connecting to Windows PC ※ A long press changes the mode and turns on the sensor.
② Sensor-ID	This is the sensor's unique number and is displayed along with the sensor name in the device name when connected via Bluetooth.
③ Battery	Check the battery status, and when charging via USB, the display will change to charging.
④ Value	1) Displays sensor measurement values and units in real time. 2) For sensors with <b>multiple ranges</b> , the current range is displayed. 3) For <b>multiple sensors</b> , the values for each sensor type are displayed.

## How it Works

The Light sensor for measurements of:

## Light Sensor

The Light sensor is an ambient light sensor with an integrated photodiode. It uses a photodiode whose spectral response is optimized to mimic the human eye's perception of ambient light and incorporates IR and UV blocking capability. The adaptive gain block automatically selects the correct lux range to optimize the counts/lux.

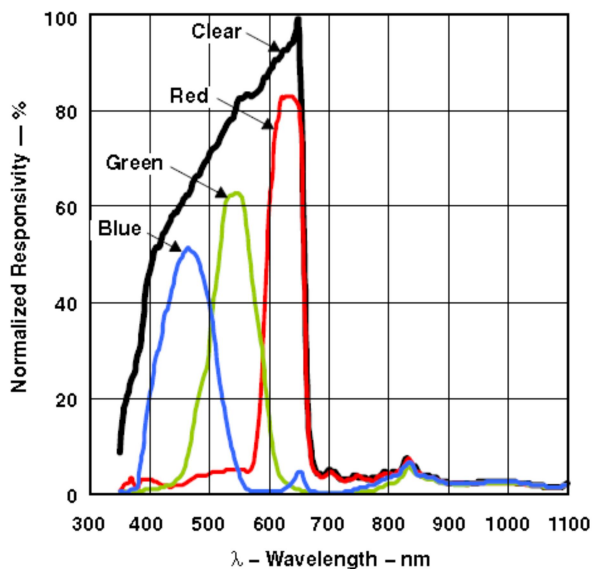


The spectral sensitivity of the photodiode and the human eye (CIE curve) are shown in the figure to the right. As can be seen, the human eye has its peak sensitivity at 555nm (green), while that of blue (~470nm) and red (~630nm) is much lower. The human eye also is blind to infrared (> 700nm) and ultraviolet (< 400nm) radiation.

## Color Sensor

The digital color sensor is designed to accurately derive the color chromaticity and illuminance (intensity) of ambient light and provide a digital output with 16 bits of resolution. The device includes an 8 x 2 array of filtered photodiodes, 4 analogue-to-digital converters, and control functions on a single monolithic CMOS integrated circuit.

Of the 16 photodiodes, 4 have red filters, 4 have green filters, 4 have blue filters,



and 4 have no filter (clear). The figure below shows the spectral responsivity of the sensor. Note that spectral responsivity is normalized at 655 nm.

## UV Sensor

The UV Index is a number linearly related to the intensity of sunlight reaching the earth. The UV Index has been standardized by the World Health Organization in the way shown in the table below. The higher the UVI, the greater the potential for damage to the skin and eye, and the less time it takes for harm to occur.

11+	<b>Extreme high</b>	Extra protection required
8-10	<b>Very high</b>	
6- 7	<b>High</b>	Protection required
3 – 5	<b>Moderate</b>	
1-2	<b>Low</b>	No protection required

## Using the Sensor

The measuring section (below the sensor) measures light intensity, RGB, and ultraviolet rays. There are a total of three sensors: illuminance, RGB, and ultraviolet rays, and the sensor conversion method changes each time you press the power button while the sensor is turned on. Changes are displayed on the LCD screen.

- LUX : illuminance sensor
- Color : color sensor
- UV : ultraviolet rays


### Experiment sample – Intensity of light according to distance

- ① Prepare a 30cm ruler and a flashlight.
- ② Run Science# and connect the illuminance



chromaticity sensor via Bluetooth.

③ Set the experiment settings as **[Manual collection]-[Line chart]-[Number input]-[x-axis title: *Distance*]**.

④ Press **[Start]**, press Start Experiment, turn on the flashlight, and  press to measure the illuminance from a distance of 1cm.

⑤ Move the illuminance sensor further away from the bulb's filament at 1cm intervals to collect illuminance data for each distance.

⑥ Finally, measure the illuminance at a point 30cm away and click End experiment to complete data collection.

⑦ Click **[End]** to end data collection.

⑧ Look at the graph and check the relationship between light intensity and distance.

## Specifications

Item	Description
<b>Range</b>	Light intensity : 0 to 90,000 Lux (Max. 188,000 lux) Color : RGB in the range 0 – 65,535 count UV : 0 ~ 11 UV index
<b>Resolution</b>	Light intensity : vary exponentially Color : 1 count UV : 0.1 index
<b>Sampling Time</b>	Max. 100Hz
<b>Condition</b>	-20 ~ 60°C, ~85%RH
<b>Wireless Connection</b>	Bluetooth 5.0 or Classic 2.1
<b>Wired Connection</b>	USB-C
<b>Battery</b>	700mAh Li-Polymer rechargeable
<b>Charging Time</b>	within 2 hours
<b>Operating Time</b>	Approximately 12 hours after full charge (depending on usage conditions)
<b>EMC</b>	CE : EN 61326-1, EN 55011, EN 55032, EN 301

**CAUTION: Do not use the instrument beyond the measurement range or in conditions that exceed the short-term exposure limits. Prolonged exposure beyond the maximum permissible range can cause serious damage to the sensor.**

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