

Measuring Light Intensity

If you have an iPhone (or iPod [not mini] or iPad) install the following app from the Apple Store:

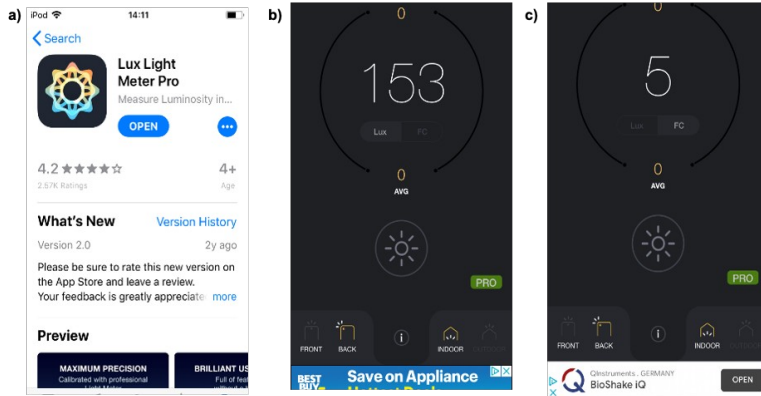


Fig. 1. a) The Lux Light Meter Pro app from the app store. b) Lux Light Meter app measuring light intensity in Lux. c) Lux Light Meter app measuring light intensity in FC.

Once installed and opened you should see Lux Meter and can choose units Lux or FC (foot candles). Choose Lux. Then choose the back camera and indoors. To take a measurement, you simply touch the light.

If you have an Android phone, you should get the following app from the Google Play store: Download and install Lux Light Meter on your phone (see Figure 2.a).

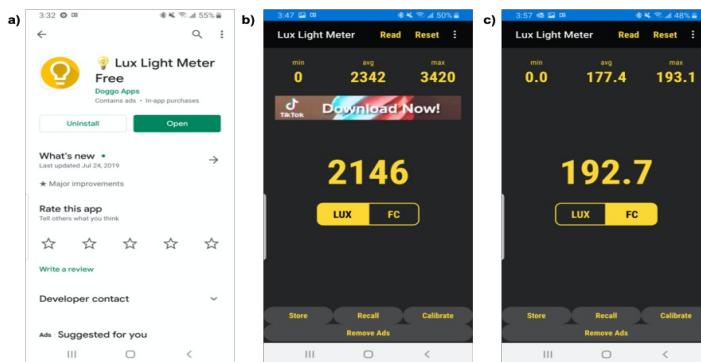


Fig. 2: The Lux Light Meter app in play store. b) Lux Light Meter app measuring light intensity in Lux. c) Lux Light Meter app measuring light intensity in FC.

This app uses a light sensor, which is typically located on the front panel of your device. The light sensors on your device can measure from 0 to 1 Lux or from 0.0 to 0.1 Foot-candles (FC).

Once you open the app, it will automatically begin measuring the light intensity. You can choose the unit of your measurement to be Lux or FC by clicking on the unit icon (Figure 2.b). Choose the unit to be Lux.

To take a measurement, remember to place your front camera to face the light source. You can see the minimum (min), average (avg), and maximum (max) light intensity on top of the app. Record the average value as the light intensity value.

You can save your data by pushing the 'Store' icon at the bottom of the app. Once you choose the name by which you want to store your data, push 'ok' and the average value of the light intensity will be saved. You can review your recorded data by pushing 'Recall' icon at the bottom of the app.

Given that the intensity measured on your phone depends on the quality of your phone's light sensor, you need to use the same phone if you want to compare measurements.

Next:

Get to know your lux meter app. Some apps will just display a number on the screen, whereas others will display a meter or a graph. Some will also let you record data. Make sure the app is working: move your phone from a dark room to a bright room, or hold it close to a light bulb (bulbs are also hot as well as bright, so be careful here), and you should see the numbers fluctuate.

Locate the light sensor on your device. It is usually near the top on the front of the phone (the side with the screen). You can do this by running your fingertip over the surface of the phone while your lux meter app is open. When your finger covers the light sensor the reading should drop. Make sure you do not accidentally cover the sensor while doing the activity.

Measure Light Intensity:

- Test how lux readings change with distance from a fixed light source. For example, stand directly under a ceiling light, hold your phone with the screen facing up, and move the phone up and down. Alternatively hold the phone sideways and aim it toward a floor lamp as you walk closer to and farther away from the lamp.

How do the readings change with distance?

- Now compare different artificial light sources at the same distance. You can use a ruler for this or any convenient object (or a body part, such as your forearm) as a spacer. The exact distance doesn't matter as long as you keep it constant. How does a flashlight compare with a light bulb? What about the light from a TV or computer screen?

What light source in your house is the brightest? The dimmest?

- Finally measure ambient light levels in different locations. Turn off all sources of artificial light. How do light levels outside compare with light levels inside? What about in a room with window coverings closed versus the window coverings open? In the room where you sleep at night versus during the day? Which room in your house gets the most natural light? Which room gets the least?

Observations and Results:

You probably noticed how dramatically lux change with distance from a light source. You might only read a few tens or hundreds of lux when you are across the room from a light bulb, but if you hold your phone right up to the bulb, the reading could be in the thousands or even tens of thousands. This is because of a mathematical relationship called the inverse square law. As the light expands outward from the source, the amount of light hitting each area drops off very rapidly. The sun is so far away you might find it surprising that lux readings in direct sunlight are so high (in the tens of thousands of lux). This gives us a sense of just how very bright the sun itself is!

Having a unit of measurement and a device to measure it can be useful for determining and comparing different environments more specifically. You might find, for example, that a specific range of lux is the most comfortable for you to read a book. These measurements can be used for designing buildings, such as schools, to ensure there is the right amount of light for different areas and activities.

Adapted from *Science Buddies* at *Scientific American*