# RF Guard® User Guide


## RF Guard®

**RF Guard®** is simple compact field strength monitor that allows me to detect and evaluate the presence of strong RF sources around - to provide piece of mind and ensure the RF safety.
I can have this unit with me all the time, paying no attention to its operation. If I get into high RF field strength area - it will give me proper notification.
I can also explore my environment, locate and evaluate all strong RF sources and mitigate their potential harm.

## How to use RF Guard®?

- Push the red button once. Unit will play ascending sound and turn on the two digits LCD display that will show software revision, coin battery voltage and average power density in %. Your **RF Guard®** is in Normal Mode and ready for use.
- **RF Guard®** consumes very little power, so, once it is turned on, it may stay on for many months, unless you really want to use the installed coin battery for years by shutting it down when not in use.
- Display will show 0.00-0.01% reading when there is no measurable RF field and will increase the reading up to the 99% at the highest measurable field and then - HI, indicating an overload.

In Normal mode unit performs the power averaging with SLOW time constant of about 1 sec, producing the RMS (root mean square) values of power density level.
- In addition to the display reading the color LED will turn on Green-Yellow-Red when the average RF field value crosses 0.1%, 1% and 10% value.
- Sound alarm will sound when display reading exceeds 1%level. If the display reading is higher than 10% the alarm intensity will rise, alerting about the high fields.
- If unit detects the relatively high RF fields you may be interested to find its source. To do that - push the red button again. Unit will switch into Explore Mode with blinking display and LED. In this mode display shows peak power density level, measured with FAST time constant of about 40 usec, capturing the pulsed RF signals.
- In order to measure the peak power density of digital communication sources Explore mode uses S/H (Sample and Hold) feature with S/H times 10 usec./1 sec., allowing display to show the peak power density values in real time.

LED detects the RF field spikes typical for the cellphone and Wi-Fi operation. Speaker will produce the level dependent sounds with the same thresholds as in Normal mode, that will allow you quickly find the origin of the strong RF radiation and measure its peak power density. Play with it and you will easily learn how it works.
- In Explore mode unit consumes much higher power, so after 2 min. it will automatically return to Normal Mode. You can switch back to Normal Mode at any time by pushing the red button.
- If you make a long 3 sec. push - unit will turn off entirely. This is accompanied by the descending sound indicating that the unit is OFF.
- Life time of the battery in the benign electromagnetic environment is about 2000 hours. If you see two blinking dots instead of numbers, battery must be replaced. The CR2032 coin cell battery can be purchased from most stores.

## How to carry and hold RF Guard®?

# RF Guard® User Guide

- **RF Guard®** has built in dual antenna that detects RF fields from the unit back (and to the less degree - from the front). So, when you hold the unit with display towards you it will measure the RF fields from the sources located mostly in front of you.
- Placing the unit in your front shirt pocket may be convenient place but bear in mind that human body absorbs the RF radiation and the readings will be lower.
- When holding the unit keep your fingers at the lower part of the **RF Guard®** body (below the display) to avoid shielding the antennas.
- Also keep the **RF Guard®** away from metal conductive surfaces - they create the undesirable resonances that may affect the readings.

## What does the RF Guard® reading mean?

- The **RF Guard®** display always shows average of the RF radiation power and is calibrated to show 100% reading corresponding to 1 mW/cm2 at 2.45 GHz. But what does it mean?
- RF safety standards that we use today were created by the end of the last century to protect people from detrimental effects of the strong RF fields, mainly - radars and powerful RF transmitters. The primary health effect of the radiation that was taken into account was - thermal heating. The magic number of 1 mW/cm2 approximately corresponds to the human tissue heating of 1°C.

So, based on that definition, 100% reading at 2.45 GHz is unsafe and should be avoided.

- But are the lower levels safe? If you have the reading of 10% that will correspond to the heating of 0.1°C (heating scales with absorbed power) and should be safe? Unfortunately, modern RF signals are digitally modulated and their peak RF power not only many times higher than their average power (which the same for the radar signals) but the envelope of the RF signal contains many frequencies that can interfere with various electrophysical processes in the human body. To make it simple; there is a vast amount of knowledge today which proves that in some cases even "safe" RF signals may be unsafe for some people. Unsafety of these situations may not necessarily be linked to permanent damage, but may instead be a cause of human functional health disorders. This is even more true for small number of people with so called "RF Hypersensitivity."
- This is the reason why we created the RF Guard®: We wanted to give in your hands the measuring device so you can exercise the Precautionary Principle - "The lower is the level of RF radiation - the better". Please, see the table below for the reference.

### ELECTROMAGNETIC FIELD DENSITY AND HEALTH EFFECTS

| RF Guard Reading | Power Density (uW/cm2) | RF Field Strength (V/m) | Safety Level Estimate for General Public, based on present studies (2023) |
|---|---|---|---|
| 100 % | 1000 | 60 | 100% level corresponds to official FCC RF safety level, established long ago for thermal heating only. This level is considered unsafe for long term exposure. Multiple studies link long exposure to levels 10%-100% to cancers and other serious health problems. |
| 10 % | 100 | 20 | |
| 1 % | 10 | 6 | Modern cellphone towers producing levels above 1% may cause serious neurological disorders. Some people with high sensitivity to electromagnetic fields can experience these disorders at lower levels, down to 0.1%. |
| 0.1 % | 1 | 2 | |
| 0.01 % | 0.1 | 0.6 | Levels below 0.01% are considered safe for most people. But using a precautionary principle, it is desirable that living areas, where people spend more than half of their lives, have even lower levels, especially for children and pregnant women. |

## Disclaimer:

Every RF Guard® unit has been calibrated at one frequency of 2.45 GHz and we post a typical frequency response in the frequency range 30 MHz-60 GHz, taken in the test lab with reference unit matching current production one.

# RF Guard® User Guide

The frequency response is not flat at it is not compliant with FCC/ICNIRP shaped probe curve either. This means that while having an ultrawide detection frequency range, at some frequencies it will show higher levels and at some - lower levels than in reality. This is the drawback of technology used and should be expected from relatively inexpensive consumer product with built-in antennas. If you happen to be in situation where RF Guard® repeatedly reads high RF levels (10-100 %) or even higher levels showing "HI", you should try to leave that area and consult a licensed RF safety professional who will analyze your particular situation with professional grade test instruments. EMC Test Design, LLC cannot be responsible for any damages resulted from such applications.

## How to take care of RF Guard®?

- Keep RF guard clean and dry. Do not expose it to the rain or submerge in water.
- Do not clean it with strong chemicals - use damp cloth with windows washer.
- Dispose the CR2032 battery properly. **Keep it out of hands of small children(!).**
- Do not disassemble the unit - there are no user serviceable parts.
- To replace the coin battery - slide down the battery cover and use small screwdriver to pry the battery.

## Features Summary:

• Designed to be carried by user to detect, notify and warn about the electromagnetic environment.
• Dual mode operation: **Normal** and **Explore**.
• In Normal mode (Slow) display and 3-color LED show the average power density level (in % of the standard safety level) with dual sound alarm turning on when level exceeds 1% and 10%.
• In Explore mode (Fast) display shows peak power density level while 3-color LED and variable pitch sound indicate pulse signals for RF source's location and identification.
• Operation is controlled by a single button: Normal - Explore - Normal - (Long Push) OFF.
After 2 min. in Explore mode unit automatically returns to Normal mode to save the battery.
• Unit has special hole at the left side - to allow the hand strap lanyard attachment. Lanyard is included.
• Unit is supplied with premium quality non slip sleeve for good hand grip and protection.
• Unit is sold in custom carton box with short User's Manual printed on insert inside.

## Technical parameters of RF Guard®

- Frequency range: **30 MHz-60 GHz**.
- Power density range Indication: **0.01%-100%.**
- Corresponding field range: **0.6-60 V/m.**
- RF safety standard level (General Public):
- 100% corresponds to 1 mW/cm$^2$ @ 2.45 GHz.
- Battery life: 2,000 hours in benign electromagnetic environment.
- Dim. (in sleeve): 93x48x15mm; 3.7"x1.9"x0.6".
- Weight: 60 g; 2 oz.
- Operating Temperature Range: -5°C to +40°C.
- Warranty 1 year.
- **Designed and made in the USA.** EMC Test Design, Sarasota, FL 34233, USA.
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