TRIFIELD®

TriField Model TF2 EMF Meter Owner's Manual

V1.0.2

TABLE OF CONTENTS

OVERVIEW

Introduction

The TriField® EMF Meter is an AC gaussmeter, AC electric field meter, and radio power density meter in a single unit, that combines all the features needed for fast, accurate measurements of electromagnetic fields (EMF). In addition to standard AC measurement modes, a special frequency weighted mode will properly scale the magnetic and electric measurements to indicate the full magnitude of currents produced by each type of field inside the human body.

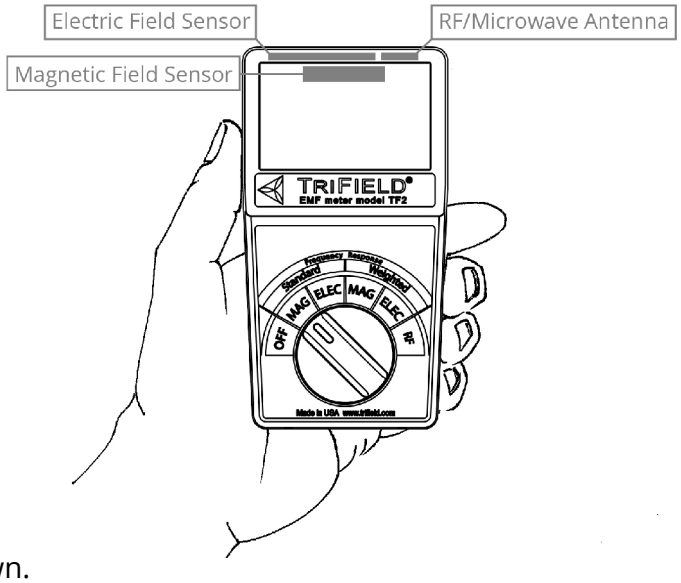
Features

- Detects all three types of EMF pollution: AC magnetic, AC electric, and RF/microwave
- Special frequency weighting mode for measuring electric current from EMF in the human body
- AC Magnetic Mode covers 40 Hz - 100 kHz with range of 0.1 - 100.0 milligauss (mG)
- AC Electric Mode covers 40 Hz - 100 kHz with range of 1 - 1000 volts per meter (V/m)
- RF Mode covers 20 MHz - 6 GHz with range of 0.001 - 19.999 milliwatts per square meter (mW/m^2)
- AC magnetic measurements are 3-axis, allowing for quick readings, regardless of meter orientation
- Large liquid-crystal display (LCD) for crystal clear, accurate readings
- Adjustable backlight for use in low-light environments
- Audio Indicator emits sound that helps to pinpoint EMF sources
- Peak Hold captures fast pulses, for measuring fast digital signals
- Operates for more than 20 hours on a 9V battery, with a low battery indicator

Applications

- Mobile phone and cell tower RF radiation
- Smart meter RF radiation
- Wi-Fi router and Bluetooth RF radiation
- Overhead AC power line and transformer EMF emissions
- Laptop, refrigerator, circuit breaker box, etc. appliance EMF emission
- EMF emission inside aircraft and motor vehicles
- Microwave oven leak
- Location and EMF of wiring in walls
- EMF from plumbing pipes used as grounding

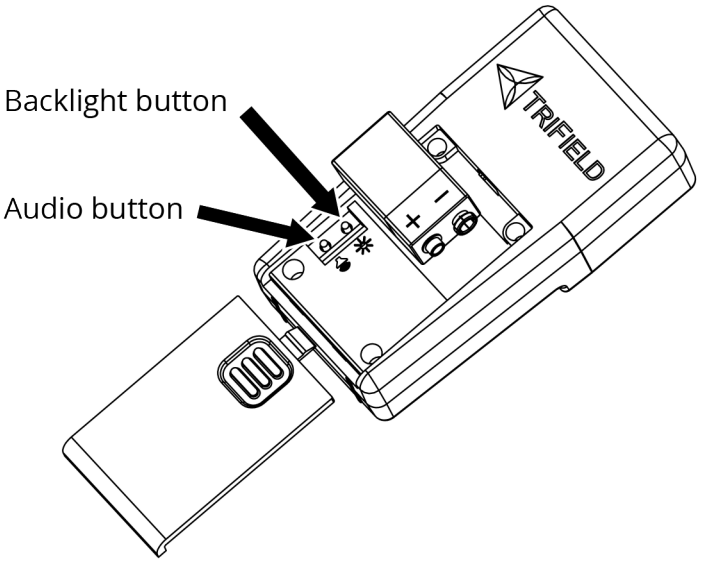
USING THE TRIFIELD EMF METER



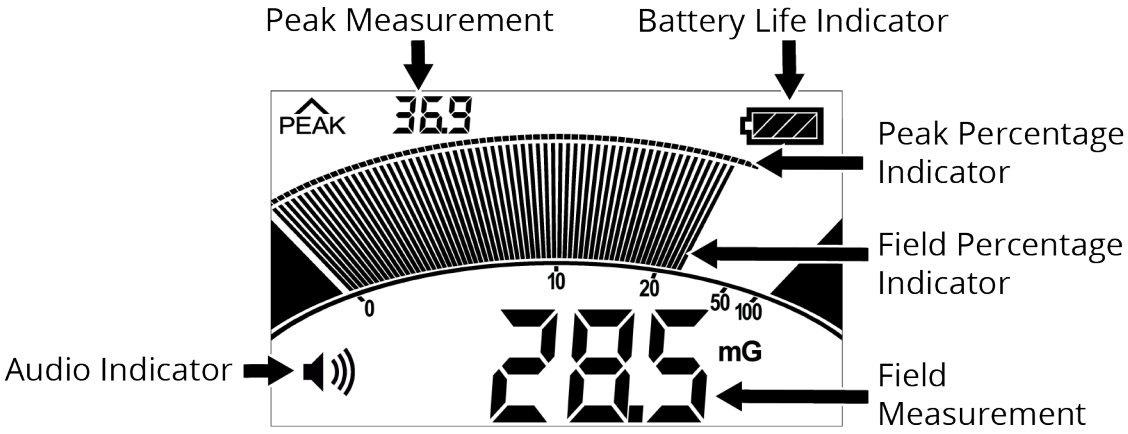
1. Hold the meter as shown.

Note: Please do not cover the sensors at the top of the meter with your hand or other objects.

2. The knob is used to switch between measurement modes and to turn the meter off when not in use.
3. For measuring the effect of EMF on the human body (or any conductive body), use the dark blue Weighted modes. For direct measurement of field strength, use the light blue Standard modes. The red RF mode can be used for any radio or microwave measuring purpose.
4. The display shows the Field Measurement number and the units at the bottom of the screen. The Peak Measurement number is shown at the top left next to the peak icon PEAK.
5. To turn on the Audio Indicator, first remove the battery cover by sliding it downward. Press the audio button . Press the audio button again to turn the audio off.
6. To turn on the backlight, first remove the battery cover by sliding it downward. Press the backlight button until the desired brightness is reached.
7. When the battery life indicator at the top right shows only 1 bar remaining, it's time to replace the battery. Remove the battery cover by sliding it downward and tap the battery compartment on the palm of your hand so the battery falls out. Replace with a 9V alkaline battery as shown.



Reading the LCD



The Field Measurement shows the numerical measurement and units, at the bottom of the LCD. The Field Measurement is averaged to give the most stable, accurate reading possible. The Field Percentage Indicator shows a circular bar graph of the percentage of maximum range that corresponds to the Field Measurement, on a logarithmic scale. The Field Percentage Indicator has a scale that shows tick marks for 0, 10, 20, 50 and 100 percent of maximum range. The Field Percentage Indicator is shown above the Field Measurement, in the middle of the LCD.

The Peak Measurement captures the highest peak that has been measured and holds that value for 3 seconds or until a higher peak is measured. The Peak Measurement can capture peaks every 12 milliseconds (ms). The Peak Measurement will be shown numerically at the top left of the LCD, next to the peak icon PEAK. The Peak Percentage Indicator shows a circular arc graph of the percentage of maximum range that corresponds to the Peak Measurement. The Peak Percentage Indicator uses the same scale as the Field Percentage Indicator and is shown above the Field Measurement Indicator.

When turning the meter on, please allow 1.5 seconds for the reading to stabilize.

AC Magnetic Field Detection

To measure the 60 Hz-equivalent effect of an AC magnetic field on the human body, turn the knob to the Weighted MAG setting and hold the meter at whatever location you want to measure. For standard technical AC magnetic field measurement, turn the knob to the Standard MAG setting.

The orientation of the meter does not matter while in the magnetic modes, because all 3 axes are combined. Your body and hand do not shield the magnetic field and do not interfere with the measurement.

The AC Magnetic Mode uses three ferrite-core coils, pointing in the X, Y, and Z directions, located near the top of the meter. The X, Y and Z signals are combined into a true magnitude of the field strength, independent of which direction the meter is pointed. Maximum range is 100.0 mG, with resolution of 0.1 mG, and accuracy of ±4% of reading at 50 Hz and 60 Hz. A frequency response graph of Standard and Weighted modes is on page 7.

In most homes or offices, some areas are “hot” spots with high readings. Most often, this is caused by magnetic fields, which come largely from unpaired internal wiring. Contrary to popular belief, power transmission lines and transformers do not generally contribute as much magnetic field indoors as does internal wiring. This is because high voltage lines carry relatively low current, and transformers are shielded. Other magnetic sources include video displays, fluorescent lights, light dimmers, transformers that are inside consumer devices, electric blankets, heaters, and anything with a motor. Much of the total field strength is from frequencies that are harmonics or multiples of 60 Hz (120 Hz, 180 Hz, etc.). Cars (especially near the front floorboard) and motorcycles have fairly strong fields at frequencies higher than 60 Hz.

AC Electric Field Detection

To measure the effect of an AC electric field on the human body, turn the knob to the Weighted ELEC setting and hold the meter at the location to be measured. For standard technical AC electric field measurement, turn the knob to the Standard ELEC setting.

Your body can easily shield electric fields; the reading is lower if you cover the top surface of the meter with your hand. Also, the presence of your hand at the back of the meter compresses the electric field, making it read somewhat higher than if the meter were suspended from a string or held on a board, away from you. In either case, the true electric field near the meter will be displayed.

The AC Electric Mode uses a metal plate sensor under the top of the meter. Circuitry similar to the magnetic section converts the signals into an electric field strength. Maximum range is 1000 V/m with resolution of 1 V/m and accuracy of ±5% of reading at 50 Hz and 60 Hz. A frequency response graph of Standard and Weighted modes is on page 7.

A few areas in most homes read high on the electric field setting. These include areas near improperly grounded equipment, the front of video displays, and fluorescent lights.

RF and Microwave Field Detection

To measure an RF field, turn the knob to the RF setting and point the top of the meter at the potential source, or simply hold the meter vertically.

Generally, your hand can shield the RF signals, so grip the meter as shown on page 2.
The RF Mode uses the same plate sensor as the AC Electric Mode. The signal is amplified and converted to a power density magnitude, calibrated at a frequency of 1 GHz (1000 MHz). Maximum range is 19.999 mW/m^2 with resolution of 0.001 mW/m^2 and accuracy of ±20% of reading at 1 GHz. A frequency response graph of the RF mode is on page 7.

When reading RF emitted by digital devices, such as mobile phones and smart meters, the Peak Measurement PEAK (small numerals in the upper-left of the display) is of more interest than the Field Measurement (large numerals at the bottom). The information from digital RF devices is transmitted in brief packets that occur irregularly (perhaps once per minute with smart meters and several times per second with Wi-Fi transmitters or mobile phones that are in use). The Peak Measurement PEAK detects these packets and displays the strongest packet for several seconds before resetting itself.

RF and microwaves are composed of a particular combination of electric fields and magnetic fields that is self-sustaining. For frequencies below about 100 MHz the principle effect on a conducting body is from the magnetic field part only. This is because the electric field component of radio waves produces much weaker currents in the body than does the magnetic field unless the wavelength of the waves is smaller than the height of the body. Low-frequency electric fields by themselves can be strong enough to create significant current, but only if they are from sources other than true radio waves.

The Standard and Weighted Modes

The light blue Standard modes for AC magnetic fields (MAG) and AC electric fields (ELEC) will measure fields using a flat frequency response. That is, all frequencies from 40 Hz to 100 kHz (100,000 Hz) are measured with equal sensitivity. The dark blue Weighted modes for magnetic and electric fields measure 60 Hz fields with the same sensitivity as the Standard mode. However, the Weighted modes are more sensitive at frequencies higher than 60 Hz, and from 60 Hz to 500 Hz, sensitivity increases proportional to frequency. That is, 1 milligauss (mG) at 60 Hz will read “1.0” on the display, whereas 1 mG at 120 Hz will read “2.0”. See the frequency response curves on page 7 for more detail. On Weighted modes, the Field Measurement shows a number proportional to the average electric current induced inside the human body from the fields, and the number is equivalent to the amount of 60 Hz magnetic or electric field that would be

required to induce that much current. However, biological reactions generally occur at speeds that are slower than 1000 Hz, so on Weighted modes, the meter is designed to become less and less sensitive at frequencies above 1000 Hz.

EMF EXPOSURE LIMITS

Many different EMF exposure limit standards have been published. Below is a table of some of the published national and international standards. There are many variables that determine the basis of these standards, including: EMF frequency, length of exposure, and affected body part(s). One thing to note is that the IEEE and most Western European limits are based on the thermal impact of EMF on the human body, whereas the Russian and Eastern European limits focus more on dose over extended exposure periods. For more detail, the sources are listed below.

	Mains Electricity (50 Hz or 60 Hz)		2000 MHz (2 GHz)
	Magnetic (mG)	Electric (V/m)	RF (mW/m^2)
Russia[1]	100	500	100
China[2]	833	3333	400
ICNIRP[3,4]	2000	4167	10,000
IEEE[5,6]	9040	5000	10,000

[1] SanPiN 2.1.2.1002-00, Sanitary and epidemiological requirements for residential buildings and premises
[2] GB 8702-2014, Controlling limits for electromagnetic environment
[3] ICNIRP GUIDELINES FOR LIMITING EXPOSURE TO TIME-VARYING ELECTRIC AND MAGNETIC FIELDS (1HZ - 100 kHZ)
[4] ICNIRP GUIDELINES FOR LIMITING EXPOSURE TO TIME-VARYING ELECTRIC, MAGNETIC AND ELECTROMAGNETIC FIELDS (UP TO 300 GHZ)
[5] IEEE Std C95.6™-2002, IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0-3 kHz
[6] IEEE Std C95.1™-2005, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

Typical Home and Office EMF Levels

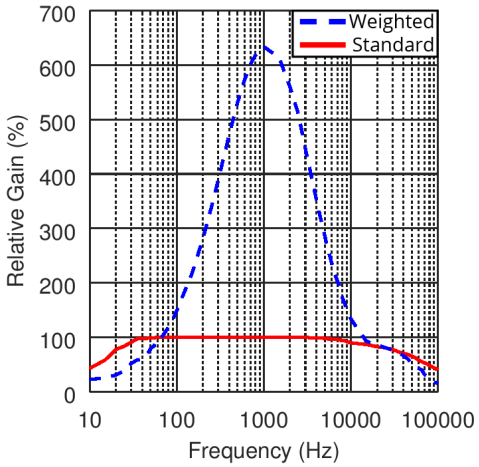
The maximum exposure limits shown above are much higher than levels you would typically encounter. Some authorities recommend much lower levels for long-term exposure, but as yet there is no consensus on safe levels. Generally, when measuring homes or offices, only the actual areas where people spend time (or where EMF-sensitive equipment is to be located) are important. In the middle of a typical home or office, magnetic field is usually less than 5.0 mG, electric field is usually less than 20 V/m, and RF is usually less than 5.000 mW/m^2.

SPECIFICATIONS

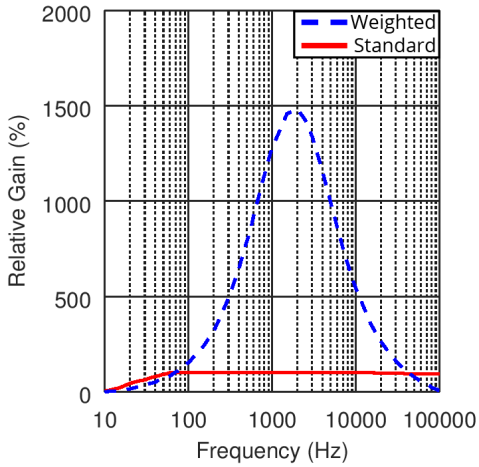
Function	TriField® EMF Meter	
AC Magnetic		3 - axis
	Frequency Range	40 Hz - 100 kHz
	Accuracy	±4% @ 50/60 Hz
	Maximum Range	100.0 mG
	Resolution	0.1 mG
	Frequency Response	See plot below
AC Electric		1 - axis
	Frequency Range	40 Hz - 100 kHz
	Accuracy	±5% @ 50/60 Hz
	Maximum Range	1000 V/m
	Resolution	1 V/m
	Frequency Response	See plot below
RF/Microwave		1 - axis
	Frequency Range	20 MHz - 6 GHz
	Accuracy	±20% @ 1 GHz
	Maximum Range	19.999 mW/m^2
	Resolution	0.001 mW/m^2
	Frequency Response	See plot below
Battery		9V alkaline battery
	Battery Life Backlight Off	> 20 hrs
	Battery Life Backlight On	> 12 hrs

Frequency Response

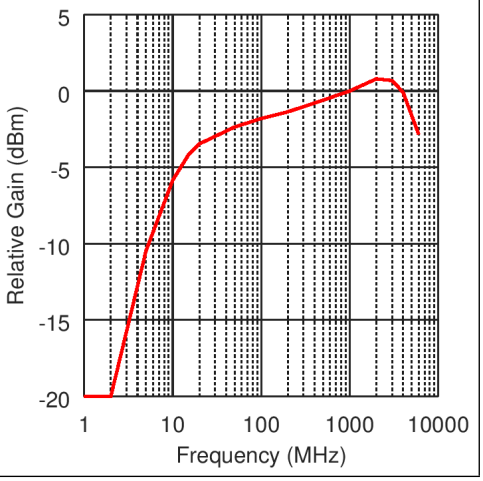
AC Magnetic



AC Electric



RF/Microwave



WARRANTY

We at AlphaLab, Inc. are very proud of our products and back each one we sell with the following warranty:

AlphaLab, Inc. warrants this product, when purchased from AlphaLab, Inc. or an authorized AlphaLab, Inc. dealer, to be free from defects in materials and workmanship under normal use and service. This warranty is valid to the original purchaser only and is non-transferable.

AlphaLab, Inc.'s liability under this warranty is limited to repairing or replacing defective materials that show evidence of defect, provided the product is returned to AlphaLab, Inc. where all parts and labor will be covered up to a period of one year.

The consumer forfeits the benefits of this warranty if the product's main assembly is opened and tampered with by anyone other than an authorized AlphaLab, Inc. technician.

The foregoing is in lieu of all other warranties, expressed or implied, and AlphaLab, Inc. neither assumes nor authorizes any person to assume any obligation or liability in connection with the sale of this product. In no event shall AlphaLab, Inc. or its dealers be liable for special or consequential damages or from any delay in the performance of this warranty due to causes beyond their control.

TECHNICAL SUPPORT AND SERVICE

If you require support, please visit www.trifield.com/support or send an email to support@trifield.com. Be prepared to describe the problem accurately. Before you return a product to the factory for service, we recommend you refer to this manual. Make sure you have correctly followed the operating procedures. Please refer to the Warranty information, which extends to the first end-user. After expiration of the warranty, a reasonable charge may be made for parts, labor, and shipping if you choose to use the factory service facility. In all cases, you are responsible for transportation charges to the factory. If a product is still under warranty, AlphaLab, Inc. will pay the return shipping.

DISCLAIMER

Use of the meter is solely at the user's discretion to identify exposure to non-ionizing electromagnetism. Because a meter of this type may malfunction, the user's responsibility is to determine if the meter is working properly, by using it to measure a known reference. Manufacturer or dealer cannot assume responsibility for damages resulting either from a defective meter (except to replace or repair said meter within the warranty period) or from inaccuracies in the present body of knowledge concerning potential health hazards of electromagnetism. The meter should be used so that simple steps (such as moving furniture) can be taken to reduce relative exposure within a home or office. If more drastic actions are contemplated, consult expert advice, and perform independent tests with another type of meter.