

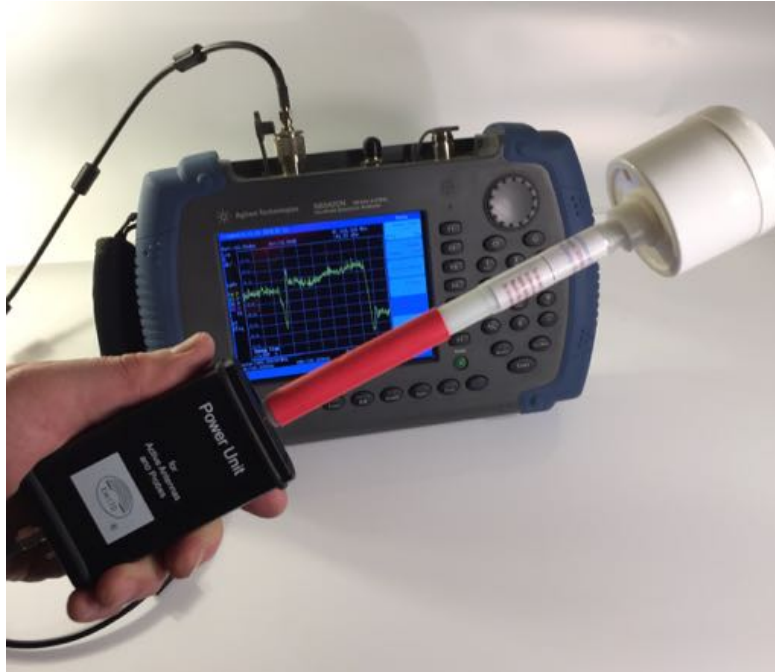
# Omnifield Antenna® Users Manual

## Model OFA-GH



Serial Number:

Congratulations! You purchased the – **Omnifield Antenna®**. Please, read this manual to get the most benefits from this innovative instrument.



**Omnifield Antenna®** - A unique broadband portable active 3-axis isotropic antenna for RF spectrum monitoring and field strength measurement. Connects to any spectrum analyzer, producing the output proportional to the field strength independently of antenna orientation or electric field direction. Has high sensitivity and broad dynamic range for the variety of RF safety, EMC, wireless and telecommunications applications.

### **Disclaimer**

- Use of **Omnifield Antenna®** for cell phone comparison is meaningful only for the models operating in the same broadcast standard. Evaluation of the SAR (specific absorption rate) requires special techniques, see [www.fcc.gov](http://www.fcc.gov).
- **Omnifield Antenna®** is not intended to be the primary piece of safety or medical equipment.
- Use of **Omnifield Antenna®** for medical and/or safety related applications must be done by qualified personnel only. Manufacturer doesn't assume any responsibilities for the results and their consequences.

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## **1. Description of **Omnifield Antenna®****

### **1.1 **Omnifield Antenna®** components**

**Omnifield Antenna®** consists of three parts: antenna head, handle and power unit. Antenna head and handle are a single module while power unit is detachable from the handle to allow convenient storage in the supplied rugged plastic case. For normal antenna operation **handle must be connected to the power unit** to provide power to the antenna sensor located in the antenna head.

Antenna sensor uses 3 antennas positioned normal to each other. Signals from each antenna are combined to allow output signal of **Omnifield Antenna®** to be proportional to the absolute value of the field regardless of the field direction.

In order to get high antenna sensitivity at extremely small size, there is an RF amplifier providing the necessary gain and matching the antenna output to the input of any standard spectrum analyzer.

Power unit contains rechargeable battery and has the RF output connector feeding the antenna signal to the spectrum analyzer. This connection is done through included 5 feet custom made flexible cable.

Ferrite beads, located on the cable, decouple the antenna from spectrum analyzer and reduce the effects of this analyzer on measured field. This cable also allows operator to have freedom to place the antenna in right position either on non-metal table tripod (supplied with every system) or onto optional 5 feet non-metal tripod.

## **1.2. Modes of Operation**

There is only one mode of operation - "ON", indicated by the green LED located at the bottom of the power unit. This assures the user that antenna parameters are known and there is no ambiguity for instrument setting errors.

## **1.3 Power Management**

Rechargeable battery in the power unit module lasts for about **20 hours** (after full charge). Battery voltage is monitored by the green LED that goes off when battery needs recharging.

There is power jack for DC 12V/0.5A charger supplied with every unit. Fast charging takes up to **2 hours** depending on battery condition. This charges the battery to about 80% of its capacity and guarantees antenna operation for about **16 hours**.

During the fast charging LED goes red indicating the "fast" charge. After maximum of 4 hours unit switches to "trickle charge" bringing the battery to full charge after 3-4 more hours. During the fast charge power unit module may become warm - it is normal.

**Do not keep unit connected to charger all the time. This will shorten the life of the rechargeable battery (!).**

Smart charger allows unit to be either OFF or ON during the charge process. This doesn't affect the charging.

Our charger is universal switching 100-240 VAC power supply. Typically, it produces no RF band emissions, therefore in most cases it is possible to operate [Omnifield Antenna®](#) with power unit connected to the charger. In some cases the charger (or "dirty" AC line) RF emissions may affect the antenna reading of weak signals. In such cases the battery operation is recommended.

## **1.4 Antenna Factors**

Every [Omnifield Antenna®](#) comes with measured Antenna Factors (AF), documented in the Calibration Certificate supplied with every unit (see Section 10 of this Users Manual). AF are taken for the particular serial number of the antenna/power units, and take into account the loss in the supplied antenna cable. If you get the SD card it will contain the AF factors in simple two-column format ready for import into the spectrum analyzer memory for field strength display in electric field units.

Though antenna handle can be connected to power unit through the cable, AF were measured for direct connection of the antenna handle to power unit.

AF is expressed in dB(1/m) and need to be added to the antenna output level in dB(uV) to achieve the measured field in dB(uV/m).

$$\text{Field (dBuV/m)} = \text{Voltage (dBuV)} + \text{AF}$$

When measured the AF, antenna was rotated around its axis, minimum and maximum values were detected and their average has been recorded.

The isotropicity of the [Omnifield Antenna®](#) simplifies the measurements because it eliminates the need to rotate or reposition the antenna head during the measurements. AF can be accounted either manually or stored in the spectrum analyzer memory for automatic field strength display.

### **1.5 Tripod Mounting**

Antenna handle can be mounted on non-metal tripod supplied with system. This gives to the user a possibility to position the [Omnifield Antenna®](#) in various orientations to secure it at a distance in order to reduce measurement errors caused by the effects of the conductive objects or operators body.

To install the antenna handle on tripod - use the nylon clip supplied with system. Remove the stock black screw from the tripod, install the supplied thumbwheel screw and secure the probe in clip with nut.

In order to get an accurate field strength reading – keep all conductive parts (including cable, operator hands, etc.) away from the antenna head.

For field or lab use when antenna must be positioned at certain height - use non-metal tripod. Though the 5 feet high quality flexible cable (supplied with every system) fits most of the applications, longer cables may be needed. We can offer the 10 feet flexible low loss cable option meeting your needs. It comes with documented loss parameters for accurate antenna factor calibration.

## **2. Handling and Maintenance**

In spite of the rugged design this instrument requires gentle and responsible handling. Please, use the following practices when using this instrument:

- Use only when [Omnifield Antenna®](#) is completely dry.
- Do not immerse into water, neither leave under the rain or snow uncovered. If wet – allow instrument to dry for 24 hours in dry ventilated place before use.

- Do not attempt to open the antenna head or power unit - there are no user serviceable parts inside. Replacement of the rechargeable battery (if necessary) can be done only at the manufacturer's facility (!).
- For battery charging use only supplied AC/DC adapter. Use of the typical off the shelf non-regulated adapters may cause the damage of the instrument (!).
- Instrument is supplied in hard case with padded insert – use it for storage and transportation.
- When connecting or disconnecting the handle and cable to the power unit - apply gentle force. Do not over-tighten the connectors.
- Do not use the instrument near AC lines or high voltage sources, because there is a safety risk for the operator (!).
- To clean the **Omnifield Antenna®** use soft tissue wetted with mild household glass cleaner (weak ammonia solution). Do not use the solvents that may damage plastic parts.
- If there is ever a need to clean the connectors – use cotton swab wetted with alcohol. Let it dry before use.

### **3. Measurement Hints**

Operation of the **Omnifield Antenna®** requires the user to be familiar with basic spectrum analyzer techniques. In order to get the best accuracy of measurements few things should be noted:

- Keep unit calibrated. We recommend calibration once a year in our NIST/UK NPL traceable EMC Test Lab.
- Internal X-Y-Z antenna switching frequency is about **3 KHz** (full 3-axis cycle). This requires spectrum analyzer bandwidth (BW) to be greater than at least 3 KHz. Smaller BW will reduce the noise and will allow the measurement of the smaller fields.
- To get the best accuracy of the amplitude reading use the BW setting of the spectrum analyzer higher or equal to **10 KHz**. The "Antenna Factors" are measured with BW **10 KHz**.
- It is possible to use smaller BW resolution - as low as **1 KHz**, but displayed signal amplitude may vary from trace to trace and will require **Max Hold** mode of the spectrum analyzer for correct reading.
- Because **Omnifield Antenna®** produces signal with amplitude corresponding to the field strength absolute value, spectrum analyzer scans should be slow. As rule of thumb - increase the SR until you see the signal trace with stable peak value.
- Another way to get an accurate readings - use **Max Hold** peak detection mode of the spectrum analyzer.
- Use tripod – it eliminates the effects of your body on the field.
- Every unit has its maximum output field, see the Specification. Antenna will tolerate the higher fields but be aware that in the case of overload antenna amplifier may be saturated.

- To convert the field strength (V/m) into power density ( $\mu\text{W}/\text{cm}^2$ ) of the far field plane waves having wave impedance of 377 Ohms, use formula:  $S = E^2/3.77$ . Additionally, the following formulas help with units conversion:

$$E(\text{dBV}/\text{m}) = E(\text{dB}\mu\text{V}/\text{m}) - 120; \quad S(\text{dB}\mu\text{W}/\text{cm}^2) = S(\text{dBmW}/\text{cm}^2) - 30.$$

#### **4. External AC Fields**

Omnifield Antenna is designed to be immune to the external AC fields of the 50/60 Hz line frequency and strong AM transmitters. In case of harsh environment with strong fields outside of the frequency range of the instrument the following tips will reduce the measurement errors:

- Use only battery power for **Omnifield Antenna®** and spectrum analyzer.
- Do not connect power unit metal case to any AC power lines or ungrounded metal objects due to the risk of electric shock (!).

#### **5. Battery Replacement**

6V/700 mA NiMHd custom made rechargeable battery is located inside the power unit. For charging use ONLY included power supply.

- Battery may need replacement after about 5 years of operation. Send your instrument for calibration and we will replace the old battery for fee.

#### **6. Specification**

##### **Omnifield Antenna® OFA-GH**

- Portable isotropic 3-axis EM field antenna with broadband response.
- Wide field dynamic range:           **10 mV/m - 500 V/m.**
- Noise Level                                   5 mV/m (BW 3 KHz)
- Broad frequency range:           **30 - 6000 MHz.**
- Probe directivity:                    Isotropic.
- Calibration accuracy:               +/- 1.5 dB.
- Linearity deviation                    +/- 1 dB.
- Rotational isotropicity (typ.):       +/- (1-2.5) dB (30 - 1000 MHz),  
+/- (2-5) dB (1000 - 6000 MHz).
- Recommended SA bandwidth:        10 KHz ( min BW 3 KHz )
- Design:                                     Antenna head is mounted on nonmetal handle with detachable output connector.
- Operating temperature:           -10 °C to 50 °C, RH 10%-90%, non-condensing.
- Temperature error:                   <0.08 dB/°C.

- **Dimensions:** Antenna: (LxD) 9.0"x2.25" (225x58 mm).  
Power unit: (LxWxD), 3.75"x2.25"x1.25"  
(95x58x32 mm).
- **Weight:** Antenna: 0.2 lb. (100 g),  
Power Unit: 0.44 lb. (200 g).
- **Battery operation time:** **20 hr.** NiMHd rechargeable battery.  
Charge, fast charge and low battery indicator.
- \* **Calibration:** Every system: antenna, low loss 5 ft. cable  
and power module are calibrated together. UK  
NPL traceable calibration certificate is supplied  
with each unit.
- **Accessories:** Omnifield Antenna® comes in foam padded hard carrying case  
and includes the OFA-GH antenna, PU-5G power module, cable, tripod, plastic clip  
and product documentation. Special 1.5 m (5 ft.) low loss high flexibility cable  
supplied with every unit. Cable has multiple ferrite beads to minimize cable effects  
on the measured field. Probe clip and nonmetal portable tripod are provided.

*Note: This Specification may be changed without notice due to continuous improvement of the design and manufacturing process.*

## **7. Limited Warranty**

The manufacturer (EMC Test Design, LLC) warrants the product to be free from defects in material and workmanship under normal use and service for the period of 1 (one) year from the date of purchase. This warranty extends only to the original buyer or end use customer of a manufacturer-authorized distributor.

Manufacturer's warranty obligation is limited, at manufacturer's option, to refund of the purchase price, or free of charge repair or replacement of a defective product, which is returned to an authorized distributor or manufacturer within the warranty period.

Manufacturer authorized distributors have no authority to extend the warranty on behalf of the manufacturer. To obtain the warranty service, contact your authorized distributor. Buyer pays for the insured shipping of the unit to be returned or serviced. Manufacturer doesn't assume any risk for damage in transit. Following the warranty repair, the product will be returned to the buyer, transportation prepaid.

If manufacturer determines that the failure was caused by misuse, negligence, accident or abnormal condition of operation and handling, manufacturer will provide an estimate of the repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the buyer, transportation prepaid, after customer has paid for the repair and return transportation charges.

The typical examples of product abuse which void the warranty are: broken antenna head or antenna handle connector, damaged cable, damaged electronics due to misuse or negligence,



EMC Test Design, LLC

etc. We will void the warranty if product has been opened, altered or repaired by unauthorized personnel.

This warranty is purchaser's sole and exclusive remedy and is in lieu of all other warranties, expressed or implied, including but not limited to any implied warranty or merchantability or fitness for a particular purpose.

EMC Test Design shall not be liable for any special, indirect, incidental or consequential damages or losses, including loss of data, whether arising from breach of warranty or based on contract, tort, reliance or any other theory.

The limitations and exclusions of the warranty may not be applicable to every buyer depending on the laws of the land of residence.

Buyer has the rights to return the unit within 14 (fourteen) days from the date of purchase using the insured prepaid carrier, in mint condition in undamaged original package with all accessories and documentation for replacement or refund. In case of refund the restocking fee of \$10% will be charged.

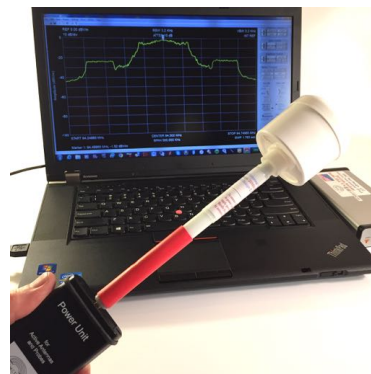
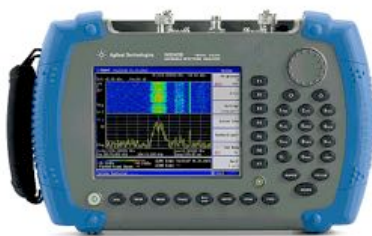
## **8. Technical Support**

To purchase the additional units, accessories, get technical support or warranty service, buyer should contact the authorized distributor or manufacturer by e-mail (preferred) or phone. The manufacturer e-mail is: [exid@emctd.com](mailto:exid@emctd.com) (check our web site [www.emctd.com](http://www.emctd.com) for the most up to date information).

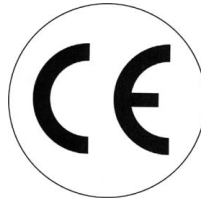
Buyer should supply the following information:

- Buyer's name, company name and contact information.
- Distributor's name, and contact information.
- Date of purchase.
- Serial numbers of the meter and probe.
- Accurate description of the issues.

## **9. Spectrum Analyzer**



Add your spectrum analyzer (shown Agilent N9340B) having the preamplifier and AF memory) or our USB spectrum analyzer **SA-S** (to **4.4 GHz**) or **SA-J** (to **12.4 GHz**) with your PC. See the **Selective Field Analyzer** product.



## **10. Declaration of Conformity**

We, the undersigned, manufacturer: **EMC Test Design, LLC**  
**P.O. Box. 600532, Newton, MA 02460, USA**  
 certify and declare our sole responsibility, that the following apparatus:

Description:	<b>Electronic Test Equipment</b>
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Brand:	<b>Omnifield Antenna®, Model OFA-GH with Power Unit, Model PU-5G</b>
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Identification:	<b>Model OFA-GH</b>
Manufacturer:	<b>EMC Test Design, LLC</b>

conforms with the essential requirements of the **EMC Directive 2014/30/EC**,  
 based on the following specifications applied:

<b>EU Harmonized Standards:</b>	<b>EN 61326-1: 2013, EN55011: 2009/A1: 2010 IEC 61000-4-2: 2009 EN 61000-4-3: 2006</b>
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with requirements of the **Low Voltage Directive 2014/35/EU**,  
 based on the following specifications applied:

<b>EU Harmonized Standard:</b>	<b>EN 61010-1: 2010</b>
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and with requirements of the **RoHS Directive 2014/65/EU**,  
 based on the following specifications applied:

<b>Equipment specifically designed for research and development for professional use.</b>
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and therefore, complies with the essential requirements and provisions of applicable CE Mark Directives. The technical documentation is kept at the following address:



<b>Signed by President of EMC Test Design, LLC/</b>  <b>/</b> <b>Date: July 15, 2018</b>
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**11. Calibration Report Omnifield Antenna®**

**Omnifield Antenna®: Model OFA-G**

**S.N. 206**

**Power Unit: Model PU-5G**

**S.N.**

**Linearity, Antenna Factor, Rotational Isotropy**

**As of this date the above instrument (antenna and cable) were calibrated to original factory specification by EMC Test Design, LLC.**

1. Generator: Wiltron/Anritsu 68347B (10 MHz-20 GHz) MHz (Verified in system).
2. Spectrum Analyzer: HP8596E 9 KHz-12.5 GHz (Verified in system).
3. Test setup: TESCOM TC-5060A, TEM#6 (Custom GTEM: 30 MHz-6 GHz).
4. Test method: Substitute method with transferable antenna field standards.
5. Antenna Field standard: Probe Isotropic PI-03 (3 MHz-18 GHz), S.N. 126.  
**UK NPL Calibration Due: August 2019.**
7. Environment: Temperature 26 C°.

Calibration Authorization: \_\_\_\_\_ *He*

Date of calibration: **07.19.18** Due date: **07.19.20**

**Attachments:**

**Omnifield Antenna® Linearity, AF and Rotational Isotropy.**

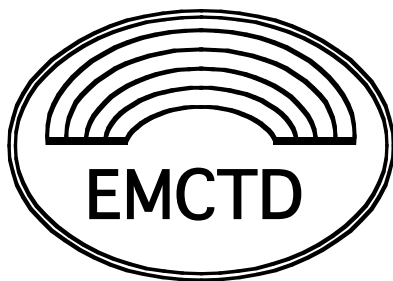


## **12. About EMC Test Design, LLC**

EMC Test Design, LLC is a company created and driven by a group of professionals with background in RF, Analog and Digital Electronics with particular expertise in RF test equipment design. We design RF test systems and innovative field strength measurements probes and antennas. We served the RF test equipment needs of our customers since 1992.

Omnifield Antenna® is designed and manufactured in Boston, MA and we are proud of it. Our office is located in Newton, MA, USA.

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