RF SAFETY CATALOG

EMF MEASUREMENT AND MONITORING TOOLS

Microwave Vision Group

Quick Guide of MVG's RF Safety Solutions





System name	EME Guard XS	EME Guard	FlashRad	EME Spy 200	INSITE Free
Product range	Worker Safety	Worker Safety	Worker / Public Safety	Public Safety	Public Safety
Key feature	• Accurate measurement with Tri-axis isotropic sensor • Preset Alarm threshold • Affordable solution	• Accurate measurement with Tri-axis isotropic sensor • User definable alarm thresholds • Data storage Software	• Real time transmission of the measurement • Broadband sensor • Cover frequencies of all cellular networks including short pulsed signals • Dedicated software for FlashRad network management	• Frequency selective portable system • Independent measurement on Uplink and Downlink for cellular network bands • Real time monitoring on PC or Smartphone (Android Application)	• Frequency selective system for in-situ spot measurement • Compatible with most spectrum analyzers available on the market • Fully automatic measurement process
Utilisation mode	Portable	Portable	Stationary	Portable	Portable
Selectivity	Broadband	Broadband	Broadband	Selectivity per services	Selectivity per channel
Frequency bands	80 MHz to 6 GHz	27 MHz to 40 GHz	Probe dependent: • 900 MHz to 11 GHz • 700 MHz to 6 GHz • 700 MHz to 3 GHz	20 selected frequency bands from 88 MHz to 5850 MHz	100 KHz to 6 GHz
Audio alarm	●	●	●		
Visual alarm	●	●	●		
Monitoring	●	●	●	●	
Data storage		●	●	●	●
Software	NA	EME Guard Analysis	FlashRad software	EME Spy Analysis	INSITE Free software
Industries/ Users	• Antenna installer & maintenance companies • Operators (cellular network, broadcast, PMR, radar, …) • Military/Defense • RF laboratory workers • Local and national authorities	• Antenna installer & maintenance companies • Operators (cellular network, broadcast, PMR, radar, …) • Military/Defense • RF laboratory workers	• Military/Defense • Telecom Regulators • RF laboratory • Local and national authorities • Operators (cellular network, broadcast, PMR, radar, …)	• Local and national authorities • Telecom Regulators • Research agencies, R&D labs, universities • RF laboratory workers • Real estate pre certification	• Certification agencies • Telecom Regulators • Operators (cellular, network, broadcast, PMR, radar, …) • Research agencies, R&D labs, universities • Military/Defense
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The Smart Choice for RF Safety

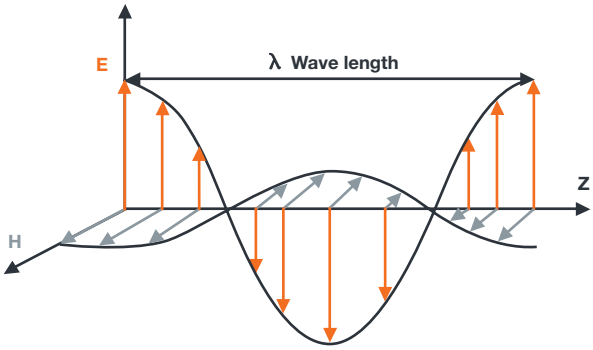
Since its creation in 1986, Microwave Vision Group (MVG) has developed a unique expertise in the visualization of electromagnetic waves. The Group's mission is to extend this unique technology to all sectors where it will bring strong added value. Year after year, the Group develops a complete range of Radio Frequency (RF) instruments to measure the level of exposure to the electromagnetic field and to address the following needs:

- **To continuously record the electromagnetic field level and alerts the user to potential overexposure**
- **To monitor actual levels and compare them to the regulatory limits**
- **To address public concern through appropriate communication**
- **To simulate EMF radiation in real environments**

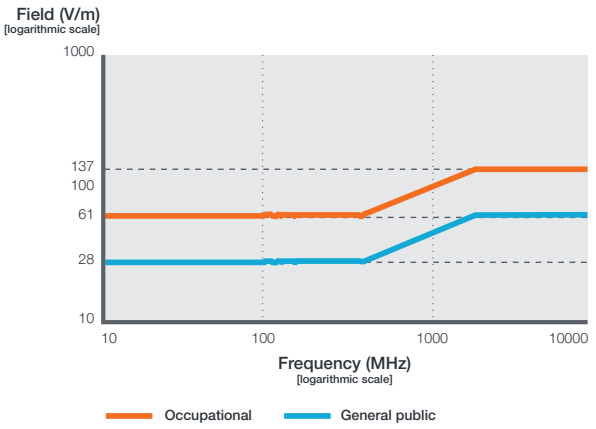
Why do we measure exposure levels?

Electromagnetic fields are increasingly present in our living environment. For this reason they arouse ever more concern and raise questions about the possible harmful effects of these fields on health. As part of its public heath charter and in response to growing concerns, the World Health Organization (WHO) introduced the International Electromagnetic Fields Project in 1996. This Project aims to assess the health and environmental effects caused by static or variable electric and magnetic fields in frequencies from 0 to 300 GHz.

Wherever there is electricity (voltage or current), there is electromagnetic field (EMF). All types of wireless transmissions (radio/TV broadcasting, voice/data wireless communication) use electromagnetic fields. The generated field propagates in the form of waves and is all around us even if we cannot see it or hear it. The electromagnetic field has two components: the Electric E Field and Magnetic H Field, and they are proportional to each other in far field measurement.



ICNIRP - Reference levels for exposure to electric fields



BASIC RESTRICTIONS AND REFERENCE LEVELS

To protect individuals from the potential health effects of radio waves, protection levels known as **basic restrictions** were recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP - http://www.icnirp.org). The ICNIRP is the non-governmental organization officially recognized by the WHO and the International Labor Organization (ILO) in the field of Non-Ionizing Radiation.

These basic restrictions were established based on published biomedical studies and relative to the health effects of electromagnetic waves. In the area of high frequencies, they are expressed in terms of **Specific Absorption Rate (SAR)** and the biological effects appear above 4 Watts per kilogram for the entire body (increase in body temperature of more than one degree) and above 100 watts per kilogram locally.

The basic restrictions are set so as to take into account uncertainties related to personal sensitivity, environmental conditions and diversity in the age and state of health of the populations concerned. The protection levels for workers were established at one tenth of these exposure levels producing an impact, and fifty times lower for the general public. For the general public, the basic restrictions thus require that the power absorbed per kilogram (SAR) be at 0.08 W/kg maximum for the entire body and 2 W/kg maximum for 10 grams of tissue.

Given the complexity of measuring the SAR in situ, the ICNIRP (based on the studies carried out to find the relation between a plane wave power surface density and the power absorbed by an ellipsoid representing a human body) has defined **reference levels** deduced from basic restrictions and **expressed in Volts per meter or Watts per square meter.** Compliance with all the recommended reference levels will ensure that the basic restrictions are observed. If the measured values are higher than the reference levels, this does not necessarily mean that the basic restrictions have been exceeded. In this case, check whether these levels of exposure are lower than the basic restrictions.

REGULATION LINKED TO THE EXPOSURE LEVELS

In Europe, the exposure limits follow the **European Union Council Recommendation 1999/519/CE of July 12th 1999** regarding the **public** exposure to electromagnetic fields. The exposure limit values are revised periodically if needed. The last report from the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR), an independent European Commission body, on the health effects of electromagnetic fields, came out in January 2009. The conclusions of this report do not challenge the exposure limit values proposed by the above-mentioned European recommendation.

The great majority of European Union member countries follow this recommendation either by incorporating it into national regulations (Austria, Czech Republic, Estonia, Finland, France, Germany, Hungary, Portugal, Romania, Slovakia, Spain) or in the form of recommendations (Denmark, Ireland, Latvia, Malta, Netherlands, Sweden, United Kingdom).

However, different approaches are applied in certain member states with the introduction of more restrictive limits in "living areas" (Belgium, Bulgaria, Greece, Italy, Lithuania, Luxembourg, Poland, Slovenia). The same goes for Switzerland and Liechtenstein. The values chosen by these States are based on the application of the principle of precaution related to potential health risks related to exposure to electromagnetic fields and the exposure limit values were in most cases set in an arbitrary manner.

Concerning **workers**, as part of the **European directive on exposure of workers to the risks arising from electromagnetic fields** (directive 2013/35/EU of 26 June 2013), all employers must now determine the exposure (levels, duration), assess risks and take the necessary measures to ensure safety and protect the health of workers from the risks arising from professional exposure to these electromagnetic fields. In particular, they must:

- measure and/or calculate the electromagnetic field levels to which workers are exposed, via the appropriate departments at regular intervals
- record the results of this assessment on a reliable medium that can be consulted subsequently

Other information concerning the regulation throughout the world may be found directly on the WHO website: http://www.who.int/docstore/peh-emf/EMFStandards/who-0102/Worldmap5.htm.

MEASUREMENT PROTOCOLS AND STANDARDS

In order to compare the exposure levels measured at the established limits, measuring protocols have been established by the main standardization bodies. Some examples are the ECC/REC/(02)04 recommendation and the EN50383, EN50413, EN50492, EN62311 standards in Europe and the IEEE Std.C95.3 standard in North America.

WHY MEASURE ELECTROMAGNETIC FIELDS?

Measuring the electromagnetic field is essential to check that exposure levels respect the regulatory limits established in each country, and thus ensure the safety of individuals exposed, whether members of the general public or workers.

For individuals who work in proximity to high frequency emmiters, the measurement ensures that the emitter is switched off when the intervention takes place and/or that the electromagnetic fields are well below the recommended levels. It thus reassures these individuals who can then complete their work without worry. The introduction of a Monitoring network on the work site allows this exposure to be constantly monitored. In either case, the measurement allows the employer to check that employees have not been over-exposed during their assignments.

Unlike a simulation or calculation, a measurement is concrete. Communicating the measured exposure levels, which are mostly very low as compared to the reference levels, provides reassurance for the concerned public. If the measurement reveals high levels of exposure, it then allows remedial actions to be implemented. Here again, the measurement can be occasional in time and space: an exposure meter can be lent to an administration official, who for a given period can check the levels to which he/she is exposed in the home or workplace, or it can be performed via a Monitoring network, with each probe sending these measurements over time to a database or eventually to a website, which can then be used by the authoroties (muincipality for example) to communicate the overall exposure of a city to the public.

The measurement taken by scientists by lending an exposure meter to a representative panel also allows us to find out the average exposure for a given population, and potentially the change in this exposure according to the technology (television broadcast, 2G, 3G, 4G mobile communications, domestic networks).

Finally, the measurements can be used to confirm and/or calibrate a propagation model. An appropriate combination of simulation and measurement allows us to obtain a precise mapping of exposure in a large geographic area, and to monitor changes to this exposure over time, in quasi-real time mode.

HOW TO MEASURE EXPOSURE TO ELECTROMAGNETIC FIELDS

Exposure to electromagnetic fields is generally measured using a probe and a receiver (Volt meter or power meter). An electromagnetic field probe is an "antenna" that has been optimized to measure exposure to electromagnetic fields.

There are two types of probe for measuring exposure to electromagnetic fields: "broadband" probes and "frequency selective" probes.

A broadband probe generally comprises a dipole and a diode connected directly between the two poles of the antenna. Using this type of probe, the voltage proportional to the field level is measured. The quality of this type of probe will therefore depend on its ability to provide the same voltage for the same field and regardless of the frequency (frequency is of course within the usage bandwidth) of the field to be measured. These "broadband" probes provide information on the level of exposure, but do not indicate the frequency of the field to which the user is exposed. They are mostly used in warning products (worker exposure meter) or for a quick measurement of compliance when measured levels remain low. This type of probe is defined by its isotropy, its bandwidth, its sensitivity, its measurement dynamic, its frequency flatness and its linearity.

The second type of probe, depending on the recevier topology used with it, provides information regarding the frequency and the amplitude of the measured field, as well as information on the level. They are incorporated into more refined compliance or information measuring products. They are defined by their isotropy, their bandwidth, and their antenna gain or factor: the dynamic, sensitivity and linearity in this case are dependent on the receiver topology used with a given probe.

Isotropy: The isotropy characterizes the ability of the field measuring probe to always provide the same response to a given field level, regardless of the direction of arrival of this field or its polarizations. It is a parameter required by most of the current measurement standards. There is no single naturally isotropic antenna: for electromagnetic field probes, this isotropy is thus obtained by combining the radiation pattern of three elementary antennae (dipole or monopole) appropriately placed with respect to each other.

Bandwidth: The performances of an electromagnetic field measurement probe vary according to the frequency of the field to be measured. They are thus defined to be used over a limited frequency range, known as the usage bandwidth.

Sensitivity: The sensitivity of an electromagnetic field measurement probe or system is the minimum level of the field that can be measured with this tool.

Dynamic: The dynamic of an electromagnetic field measurement probe or system is the difference between the maximum and minimum field that can be measured with this tool. It is generally expressed in dB.

Frequency flatness: This parameter characterizes the quality of a broadband probe. It represents the variations of the measured E-field at a fixed frequency, when the level of the E-field is varied over the dynamic range of the probe.

Linearity: This parameter characterizes the quality of a broadband probe. It represents the variations in the levels measured, with fixed frequency and making the level of the field measured over the probe's measuring range vary.

Antenna Gain and/or Factor: An antenna gain (respectively of an electromagnetic field measuring probe) characterizes its ability to emit (respectively receive) in a specified direction. It is generally expressed in dBi, taking as a reference an isotropic antenna, meaning a fictitious antenna that radiates uniformly in all directions. The gain of this antenna is thus 1, or 0 dBi (dBi for decibel-isotropic). The role of an electromagnetic field probe is to transform the recieved electromagnetic field level into RF power. The antenna factor is defined as the ratio of the electromagnetic field captured by this antenna to the voltage measured at the antenna terminals.

$$AF = \frac{E}{V_r}$$

The antenna factor (expressed in dB) is linked to its gain by the following equation:

$$AF = 20\,Log(F) - G - 29{,}78$$

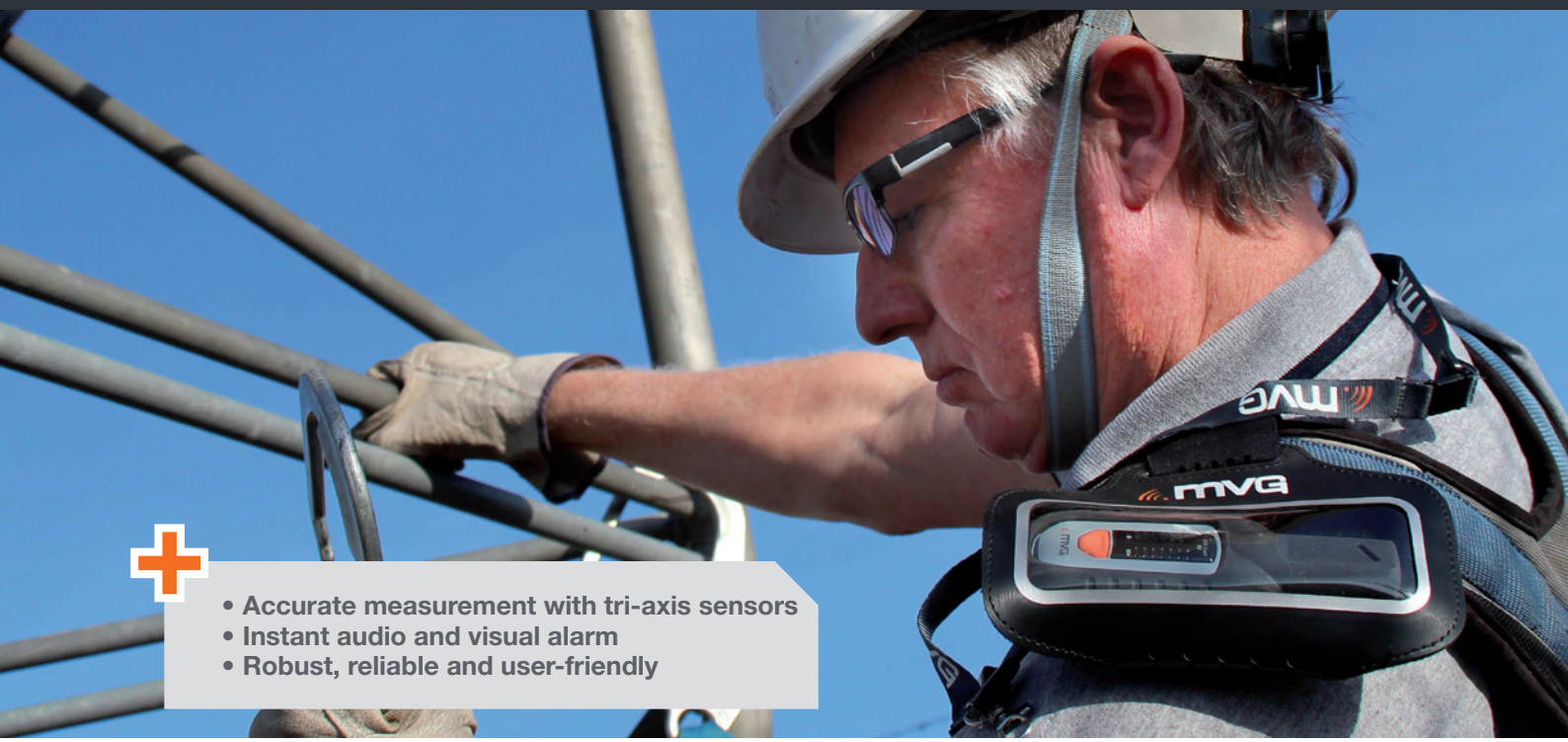
In this equation, F is the frequency in MHz, and G is the gain in dBi.
The power received by an antenna capturing an electromagnetic field can easily be found using the following formula:

$$P_r = 20 * Log(E) - AF + 13$$

In this equation, Pr is expressed in dBm, E in V/m and the antenna factor in dB.

Worker Safety

EME Guard XS



- **Accurate measurement with tri-axis sensors**
- **Instant audio and visual alarm**
- **Robust, reliable and user-friendly**

Main features

User profile

- Persons working near antennas including installation and maintenance workers, broadcast, PMR and mobile phone operators or regulatory body employees

Measurement capabilities

- Continuous monitoring of Electromagnetic Field levels with isotropic tri-axis E-field sensors
- EMF Level indicated by a LED color scale
- Audio and visual alarms triggered when EMF exceeds the reference level

Frequency bands

- 80 MHz – 6 GHz

Safety recommendations

- ICNIRP
- FCC 96-326
- Safety Code 6
- 2013/35/UE
  New EU Directive
- Alarm threshold can be adjusted at MVG factory upon request

Product Configuration

Equipment

- ■ EME Guard XS
- ■ MVG Case
- ■ Wirst strap
- ■ Lanyard
- ■ Connecting adapter
- ■ Armband
- ■ 2 x 1.5 V Size N Alkaline batteries
- ■ Instructions for use

Services

- ■ Initial calibration
- □ Additional calibration
- □ Extended warranty

■ Included □ Optional

TECHNICAL CHARACTERISTICS

Probe	Isotropic 3-axes probe
Frequency range	80 MHz - 6 GHz
Lower detection limit	5 V/m
Upper detection limit	350 V/m

MEASUREMENT UNCERTAINTY

Frequency (MHz)	Frequency response	Axial isotropy
80 - 700	-2 / +4 dB	+/- 0.5 dB
700 - 2700	-1 / +5 dB	+/- 0.7 dB
2700 - 6000	+2 / +7 dB	+/- 0.9 dB

ALARM & CONFIGURATION

Reference threshold	Alarm threshold can be adjusted at MVG factory upon request
Visual alarm	7 LEDs
Audio alarm	2 tones (activated from 5 to 350 V/m)
Low battery indicator	Orange flashing LED

MEASUREMENT CONFIGURATION

Measurement period	1 sec

CONDITIONS FOR USE

Temperature, humidity	-10°C to 50°C, 85% max humidity
Battery	2 x 1.5 V Size N Alkaline removable batteries
Battery life	> 1000 hours (> 50 days)(1)

MECHANICAL CHARACTERISTICS

Dimensions	132.5 x 48.5 x 28.7 mm (LxWxH) without connecting adapter
Weight	120 g with batteries

(1) If no alarm is triggered

EME Guard

- **Accurate measurement with triaxial isotropic probe**
- **Customization of alarm thresholds**
- **Data storage software**
- **Robust, all weather design**

Main features

User profile

- Anyone working close to emitting antennas (broadcast, base station, radars …)
- Installation and maintenance staff, broadcast, PMR and mobile phone operators or regulatory bodies employees

Measurement capabilities

- Continuously records the electromagnetic field level and alerts user to potential over-exposure

Frequency bands

- 27 MHz to 40 GHz

Related recommendations

- FCC 96-326
- ICNIRP
- Safety Code 6
- 2013/35/UE

New EU Directive

- Exposure thresholds are user-definable and can be adapted to any recommendation

System Configuration

Software

- ■ EME Guard Analysis

Equipment

- ■ Case
- ■ Belt clip
- ■ USB cable
- ■ Battery charger

Accessories

- □ Holster

Services

- ■ Calibration report
- ■ Initial calibration
- □ Additional calibration
- □ Training
- □ Extended warranty

■ Included □ Optional

A user friendly and flexible instrument

The EME Guard Analysis software defines two user profiles:

❶ Administrator mode, gives additional rights to configure the device to requirements (threshold definition).
❷ User mode, enables download and visualization of measurements recorded in the embedded memory of the device.

The Administrator can customize the device according to the thresholds defined by his own guidelines.
→ Only the Administrator is given right of access to device configuration and customize.

STEP 1: Define the reference threshold that will trigger the visual alarm. The 4 warning lights are activated as soon as exposure level attains 25%, 50%, 75% and 100% of the chosen reference threshold.

STEP 2: Define the thresholds that will trigger the audio and vibrating alarms:
Over a 6 minute mean: the alarm is triggered as soon as the mean calculated over the preceding 6 minutes exceeds the predetermined threshold. This 6 minute calculation is the reference duration which conforms to the ICNIRP recommendations.
Or:
Instantaneous: as soon as a measurement exceeds the threshold, the alarms are triggered.

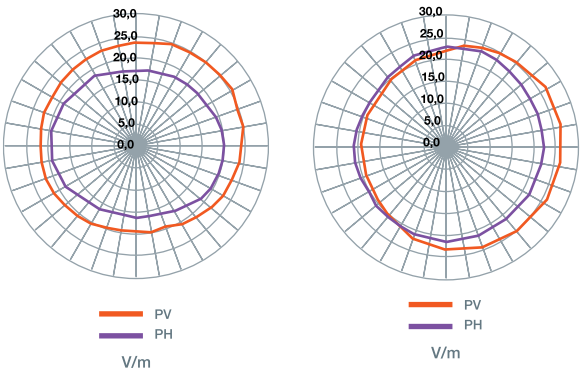
Alarm front view

The measurement files are downloaded on the PC's hard disc as binary files, thus ensuring the safety of historical data.

STEP 3: Define the recording period.
STEP 4: Start the device (ON/OFF button) and perform measurements.
STEP 5: Import the measurements in the form of secure files using a USB cable and display the results.

High performance probe for accurate measurements

The EME Guard is equipped with a triaxial probe which guarantees measurement isotropy. Each device comes with a calibration report. The performance of this sensor has been optimized to ensure maximum isotropy.



Isotropy at 1400 MHz — Isotropy at 2100 MHz

A robust product

The device is equipped with an auto-test system which is launched when the device is switched on. This test ensures that the EME Guard is functioning normally and that battery level is sufficient. In any case, if the battery level is too low, an orange warning light alerts the user immediately.

The case is metallic and ensures an IP55 Ingress Protection level, ideal for outdoor use.

TECHNICAL CHARACTERISTICS

Frequency range	27 MHz – 40 GHz
Upper detection limit	200 V/m
Lower detection limit	5 V/m
Damage Level (CW) :	> 4000 V/m (> 29 dB above standard)

MEASUREMENT UNCERTAINTY

Axial isotropy	+/- 1 dB at 1400 MHz +/- 2 dB at 2100 MHz
Frequency response	27 MHz - 2.5 GHz : +/- 3 dB 2.5 GHz - 6 GHz : + 6/0 dB 6 GHz - 10 GHz : + 12/+ 6 dB 10 GHz - 20 GHz : + 10/0 dB 20 GHz - 40 GHz : + 8/- 3 dB

ALARM & CONFIGURATION

Reference threshold	Configurable by the user 20, 40, 60, 80, 100 or 140 V/m
Alarm mode	Instantaneous or 6 min. mean
Visual alarm	4 LEDs 25%, 50%, 75% and 100% of the reference threshold
Audio alarm	Activated (from 5 V/m to 137 V/m) or de-activated
Vibrator	Activated (from 5 V/m to 137 V/m) or de-activated
Low battery indicator	Orange LED

MEASUREMENT CONFIGURATION

Update period for display and alarms	1 sec
Measurement recording	Activated or de-activated
Recording capacity	30 000 measurements MAX
Recording period	1-255 sec
Duration of recording	
• min.	1 mn
• max.	Duration in mn = 30 000 points X recording period (sec) / 60

CONDITIONS FOR USE

Temperature, humidity	-10 to 50°C, 85% max. humidity
Power supply of battery charger	110 - 240 VAC, 50 - 60 Hz
Battery	Lithium-Ion
Battery life	> 100 hours
Type of link	USB

MECHANICAL CHARACTERISTICS

Dimensions	172 x 60 x 35 mm (H, L, W) without belt clip
Weight	320 g
Protection	IP 55

HARDWARE REQUIREMENTS

Processor	PC Pentium 500 MHz or equivalent
Cable link	USB
Operating system	XP / WIN7 / WIN8
Memory	256 MB RAM
Free space on hard disk	100 MB

FlashRad

- Alert users with sound and light
- Cover frequencies of all cellular networks including short pulsed signals NEW
- Monitor low EMF levels in public areas

Main features

User profile

- Companies situated near antennas or radar transmitters, who wish to protect their employees from questionable EMF levels (military bases, airports, etc.)

Measurement capabilities

- Continuous measurement of EMF levels. Each monitor detects signals and then transmits the data to the surveillance PC to be processed individually
- Data is collected separately from each monitor in place

Frequency bands

- 900 MHz – 11 GHz; higher or lower frequencies possible

Safety recommendations

- EMF exposure limits can be defined by users and adjusted to any regulation or recommendation

Product Configuration

Software

- ■ FlashRad software on CD Rom

Equipment

- ■ External connectors (mounted on cable or not)
- ■ Ground or wall support

Accessories

- ■ Case
- □ LEDs box with alarm + USB cable

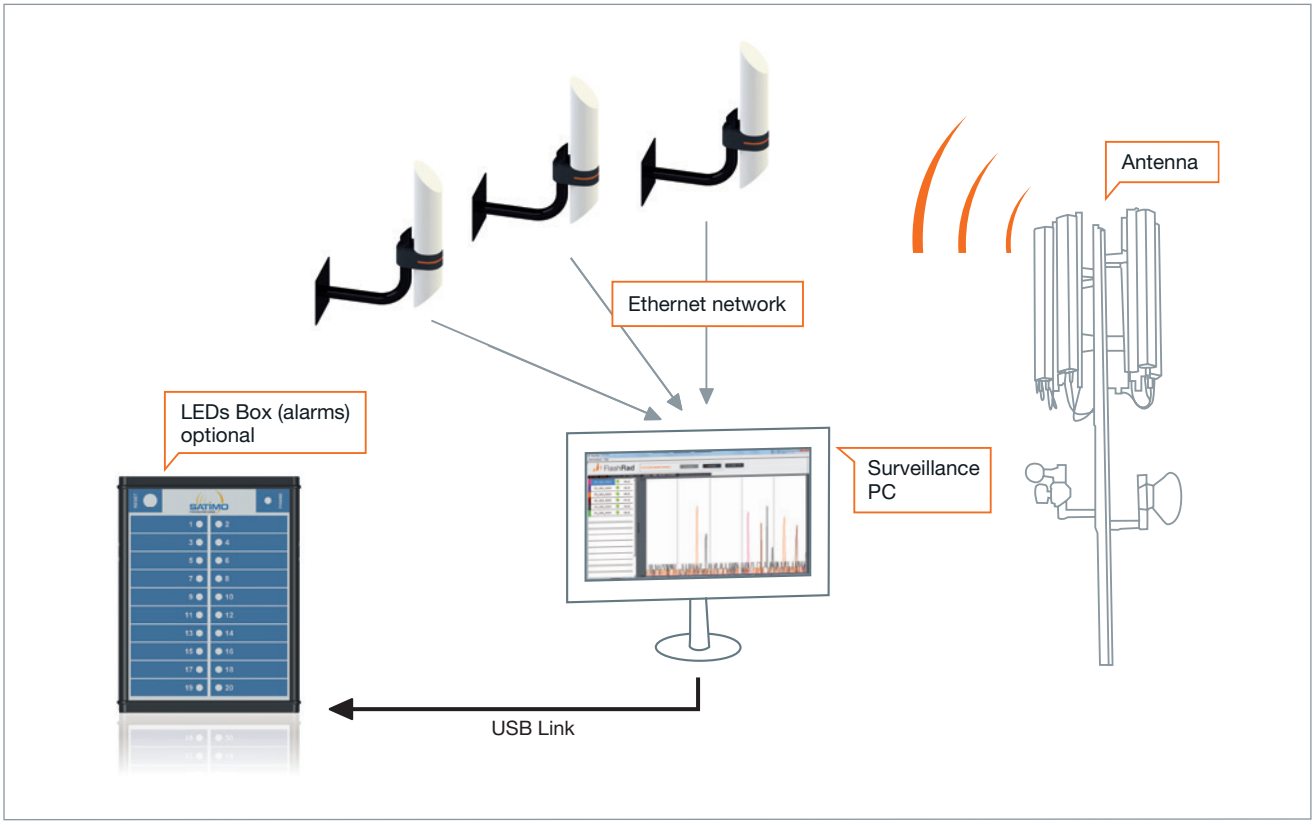
Services

- ■ Initial calibration
- ■ Calibration report
- □ Ground or wall installation
- □ Training
- □ Additional calibration
- □ Extended warranty

■ Included □ Optional

FlashRad is a safety wideband exposure monitoring system that performs continuous measurements of electromagnetic field (EMF) levels. It detects all kinds of pulsed signals, including short pulsed radar, emitted from various sources outside a building. When predetermined EMF levels are exceeded, the FlashRads monitor sounds and flashes a warning in its immediate surroundings while sending a signal to the surveillance PC for action.

Overview of FlashRad systems network



FlashRads are connected to a PC via Ethernet. Continuous EMF level measurements are sent to the PC where the FlashRad monitoring system software collects and displays the incoming data. If the FlashRads detect excessive RF levels, a signal is sent to the PC indicating which monitor is detecting the overexposed area. The technician can then take action. Note that each monitor can be stopped or started as necessary.

The PC will send a signal to trigger the alarms in the FlashRads when the EMF levels exceed the predetermined levels.

A LED light box is available as an option to allow monitoring in multiple areas. It is connected to the PC by a USB cable of up to 10 meters.

TECHNICAL CHARACTERISTICS

	HIGH LEVEL PULSED SIGNALS (RADAR...)	WORKERS AREA (BTS, TEST...)	PUBLIC AREA
Probe reference	FR100	FR200	FR300
Probe	Isotropic 3-axes probe	Isotropic 3-axes probe	Isotropic 3-axes probe
Frequency range	900 MHz – 11 GHz	700 MHz – 6 GHz	700 MHz – 3 GHz
Lower detection limit	50 V/m	10 V/m	0.5 V/m
Upper detection limit	1000 V/m	200 V/m	TBD
Destruction limit	> 1500 V/m	> 300 V/m	TBD
Minimum pulse width measurement	≥ 1 µs	≥ 50 µs	TBD

MEASUREMENT UNCERTAINTY

Axial isotropy	900 MHz – 6 GHz (@150 V/m) : +/-1 dB 6 GHz – 11 GHz (@150 V/m) : +/-2.2 dB	700 MHz – 6 GHz (@50 V/m) : +/-1 dB	TBD
Frequency response	900 MHz – 1 GHz (@150 V/m) : +3.8/-1.2 dB 1 GHz – 8 GHz (@150 V/m) : +/-2 dB 8 GHz – 11 GHz (@150 V/m) : +5/+3 dB	700 MHz – 2 GHz (@50 V/m) : +/-3 dB 2 GHz – 6 GHz (@50 V/m) : +3/+1 dB	TBD
Linearity	+/-0.5 dB (200 – 1000 V/m)	+/-1 dB (20 – 200 V/m)	TBD

ALARM & CONFIGURATION

Alarms	Audio & visual
Reference threshold	Configurable from lower until upper detection limits of the probe
Measurement records	On PC
Measurement interval	1-60 sec

CONDITIONS FOR USE

Temperature, humidity	-15°C - 50°C, 95% max humidity
Power supply	90 – 264 VAC, 47 – 440 Hz
Type of network connection	Ethernet

SOFTWARE REQUIREMENTS

Processor	PC Pentium 500 MHz or equivalent
Network connection	Ethernet
Operating system	Windows XP 7/8
Memory	256 MB RAM
Free space on hard disk	100 MB

MECHANICAL CHARACTERISTICS

Dimensions	Height = 570 mm Diameter = 100 mm
Weight	3.6 kg
Protection	IP 55

Mechanical installation

Ground Installation

Wall installation

FlashRad

Public Safety

EME Spy 200

- **LTE 800 MHz / 2600 MHz frequency bands included**
- **Independent measurement on Uplink and Downlink for cellular network bands**
- **Real time monitoring on PC (USB) or Smartphone (Bluetooth)**
- **Android Application now available**

Watch a success story of EME Spy 140

Main features

User profile

- Municipalities, governmental agencies, regulatory bodies, research laboratories, universities, broadcast, PMR, and mobile phone operators

Measurement capabilities

- Continuous monitoring of personal exposure to electromagnetic fields and identification of the contributors

Frequency bands

- 20 selected frequency bands from 88 MHz – 5850 MHz

Safety recommendations

- Measurements can be compared with the reference levels advised by ICNIRP

Real time visualization kit (optional)

- The field level for each frequency band is displayed as it is measured
- Exports data to the EME Spy Analysis software for post processing and backup

Product Configuration

Equipment

- ■ EME Spy analysis software
- ■ User manual
- ■ USB cable
- ■ 4 rechargeable batteries
- ■ Battery charger
- ■ Case
- □ Real time visualisation kit

Services

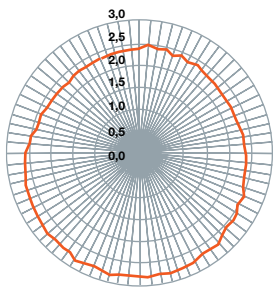
- ■ Initial calibration
- ■ Calibration report
- □ Installation
- □ Training
- □ Additional calibration
- □ Extended warranty

■ Included □ Optional

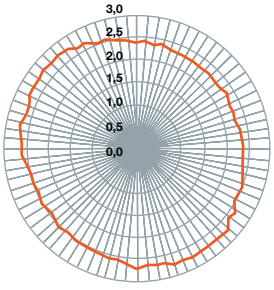
TECHNICAL CHARACTERISTICS

FREQUENCY RANGES	Frequency MIN (MHz)	Frequency MAX (MHz)
FM	87	107
TV3	174	223
TETRA I	380	400
TETRA II	410	430
TETRA III	450	470
TV4&5	470	770
LTE 800 (DL)	791	821
LTE 800 (UL)	832	862
GSM + UMTS 900 (UL)	880	915
GSM + UMTS 900 (DL)	925	960
GSM 1800 (UL)	1710	1785
GSM 1800 (DL)	1805	1880
DECT	1880	1900
UMTS 2100 (UL)	1920	1980
UMTS 2100 (DL)	2110	2170
WiFi 2G	2400	2483.5
LTE 2600 (UL)	2500	2570
LTE 2600 (DL)	2620	2690
WiMax	3300	3900
WiFi 5G	5150	5850

Differentiating uplink(1) and downlink(2) is not only useful to assess the contribution of each transmitter, but also to avoid discrepancy in the results by phones emitting close to the dosimeter.



Vertical Polarization



Horizontal Polarization

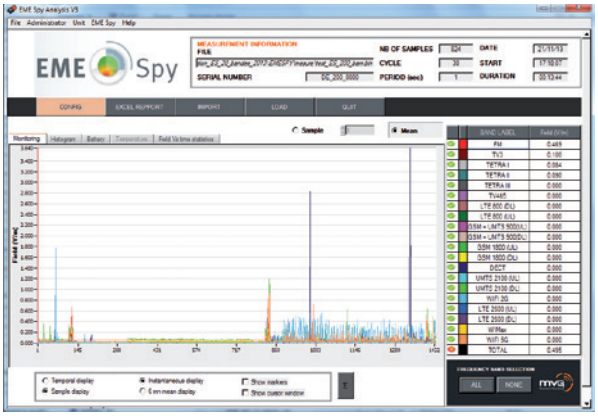
PROBE CHARACTERISTICS

Probe	Tri-axial E-field probe 80 MHz – 6 GHz
Sensitivity	• FM, TV3, TETRA, TV4 & 5, WiFi 5G = 0,01 V/m • LTE 800, GSM, DCS, DECT, UMTS, WiFi 2G, LTE 2600, WiMax = 0,005 V/m
Dynamic	61.6 dB (up to 6 V/m)

(1) Uplink: Sending of information from the mobile station to the BTS
(2) Downlink: Sending of information from the BTS to the mobile station

MEASUREMENT CONFIGURATION

Number of data points	80 000 max
Logging intervals	• From 1 to 4 bands: 2 - 255 s • From 5 to 10 bands: 3 - 255 s • From 11 to 20 bands: 4 - 255 s



EME Spy Analysis main window

OPERATING CONDITIONS

Temperature, humidity	-10 to 50°C, 85% of humidity
Battery life*	Recording mode: > 15 hours with a recording period of 10 sec > 6 hours with a recording period of 4 sec BlueTooth mode: > 10 hours of recording

* 2 rechargeable batteries

MECHANICAL CHARACTERISTICS

Dimensions	168.5 x 79 x 49.7 mm (H x L x W)
Weight	440 g
Protection	IP 55

HARDWARE REQUIREMENTS

Processor	PC Pentium 500 MHz
Cable link	USB Port
Operating system	XP / WIN7 / WIN8
Free space on hard disc	200 MB

EME Spy 200 Real Time Kit

A streamlined and ergonomic screen allows the visualization of only the most useful information in real time on a small laptop PC, tablet or smartphone via a ferrite USB cable (for Windows) or BlueTooth (for Android)

EME Spy Android Application NEW

ANDROID APP ON Google play

http://tinyurl.com/k268zrh

Viewing real-time measurements of electromagnetic field of the EME Spy.

Measurements of EME Spy are transmitted by a Bluetooth link to an Android smartphone to display the exposure levels generated by the main radio services (FM, TV, Cellular Networks, Wifi ...).

	BASIC MODE	PRO MODE
Real-time display	X	X
Backup + post-processing of measurements for compatibility with the EME Spy Analysis software		X
Geo-location of the measurements with GPS position		X
Generation of *.kmz files for compatibility with Google Earth		X

The EME Spy Android APP is certified for Smartphones below:
- Galaxy S series (Samsung)
- Xperia Neo (Sony Ericsson)
- Slim Cink (Wiko)
- XT925 (Motorola)

Geolocalized measurements in Paris

* Google Earth installation required. Visit our website for more information.

Real-time Visualization

Google Map View

INSITE Free

- **Compatible with most spectrum analyzers available on the market**
- **Tri-axial probes with excellent isotropic measurement**
- **Compatible with WIN7/WIN8**
- **Additional option for ANFR V3 protocols**

Main features

Measurement capabilities

- Performs in situ spot measurements

User profile

- Regulation agencies, certification offices, municipalities, broadcast, PMR and mobile phone operators, installers, research laboratories, administrative bodies and more

Frequency bands

- 100 KHz to 6 GHz

Related recommendations

- ECC/REC/(02)04, EN50383 and EN 50492

Compatible with most spectrum analyzers

- ANRITSU: MT8212B, MT8220A, MT8222A, MS2711A/D, MS2661B, MS2721B, MS2665C, MS2724B, MS2713E, S332D, S362E
- WILLTEK: 9101/9102
- Rohde & Schwarz: FSH3/6, FSH4/8, ZVL3, FSHP, FSV3, FSL6
- AGILENT: E7495B, ESA series, 856xEC series, N9912A
- BIRD: Signal Hawk

System Configuration

Software

- ■ INSITE Free on CD Rom with dongle key
- □ INSITE Free/ANFR on CD Rom with dongle key

Equipment

- ■ 100 KHz to 3 GHz probe
- □ 700 MHz to 6 GHz probe
- ◉ Spectrum analyzer
- ■ Switch box (with battery charger)
- ■ Probe holder
- □ Wooden tripod

Accessories

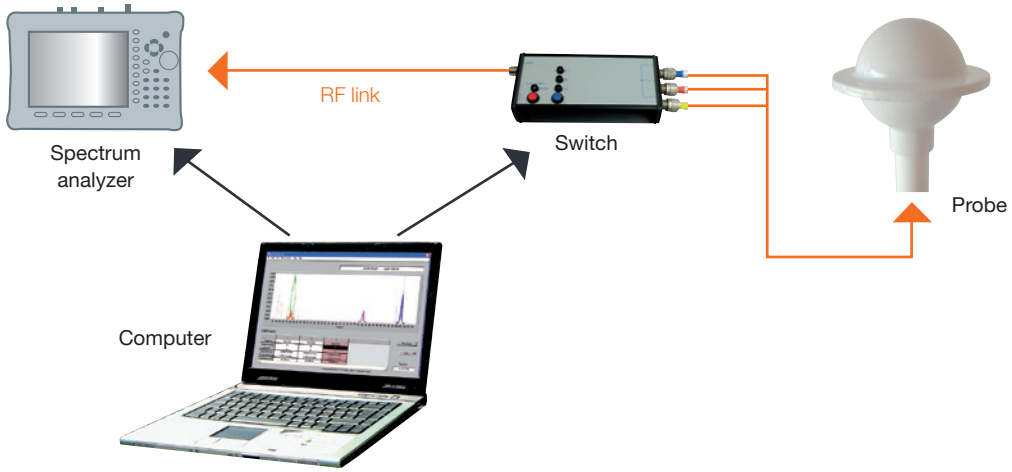
- ■ Cables

Services

- ■ Initial probe and cable calibration
- □ Additional calibration
- □ Training
- □ Extended warranty

■ Included □ Optional ◉ Required

INSITE Free is composed of a probe connected to a switch/amplification box. The system also requires a spectrum analyzer. These elements can be operated either manually or remotely through INSITE Free software. The software enables the user to define measurement scenarios, analyze measurements, review the results graphically and automatically generate reports in Excel format. The switch enables successive selections of the three measurement axes to obtain an isotropic result without changing the position of the probe. Equipped with an amplifier, the switch also improves the sensitivity of the system over the 100 KHz to 30 MHz frequency bands.



Description of the measurement chain with a 6 GHz measurement probe

Measurement scenarios can be defined by the user to fit specific requirements

❶ INSITE Free SW is a flexible tool that can be configured by the user to perform measurements and generate reports according to specific measurement protocols, in particular those recommended by ECC.

❷ In addition, for the French market, INSITE Free/ANFR SW follows the protocol v3 of the French National Agency of Frequencies (ANFR) step by step.

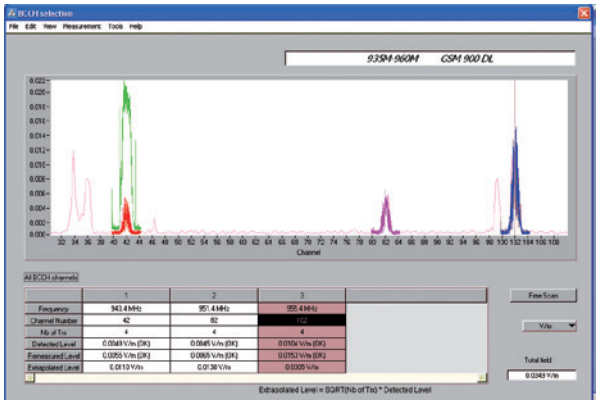
STEP 1: Choose hardware configuration

In this first phase, the user programs the measurement session according to his own hardware configuration: spectrum analyzer, GPS, probe, cable, UMTS scanner and switch. For this purpose, the probes, cable and switch calibration files are selected and loaded.
A selection of several probes is possible.
INSITE Free works with all of the most frequently used spectrum analyzers.

STEP 2: Define measurement scenario

Once the hardware has been configured, the user can program the measurement scenarios:

- Choose frequency bands to be measured from a list or create user-defined bands
- Define the channels or specific carriers
- Define channel width
- Choose attenuation mode
- Choose analysis mode (peaks, TDMA or W-CDMA)
- Choose automatic or manual definition of RBW/VBW



Selection of BCCH for TDMA Analysis

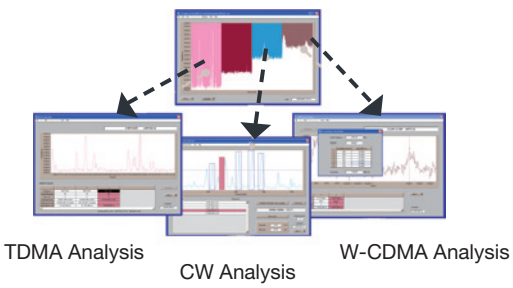
STEP 3: Perform measurement analysis.

The data collected for each band is presented on the main window of the software. Measurements corresponding to each of the three axes can be displayed in order to check the polarisation of the electric field.

Depending on the characteristics of the spectrum analyzer, the user can repeat the following analysis modes:

- CW Analysis: selection of peaks according to predefined threshold
- TDMA analysis: extrapolation of BCCH value
- W-CDMA analysis: UMTS decoding (measurement and extrapolation of the CPICH value)

The user can re-launch measurements using specific detection modes (positive peak, negative peak, sample…) and measurement modes (Max. hold, Min. hold, and average) available with the spectrum analyzer.



STEP 4: Visualize results

The results can be visualized with the following functions:

- Full scan or per frequency band
- Zoom in with peak identification threshold
- 3 types of scales for a better high and low band visualization
- Quick view of element's properties

Sessions are saved in XML and results can be exported to Excel. The results can be compared to the reference levels given by specific guidelines. Two guidelines are available by default:

- ICNIRP
- Safety Code 6

(Other reference levels can be added upon request).

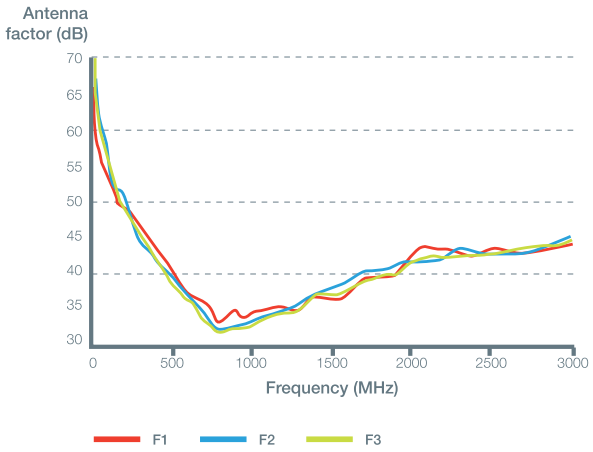
High performance isotropic probes to cover the 100 KHz to 6 GHz frequency ranges

Two probes are available: from 100 KHz to 3 GHz and from 700 MHz to 6 GHz. Both probes are made of three orthogonal monopoles. The patented shape of each monopole optimizes the functioning and isotropy of the probe over the entire frequency range.

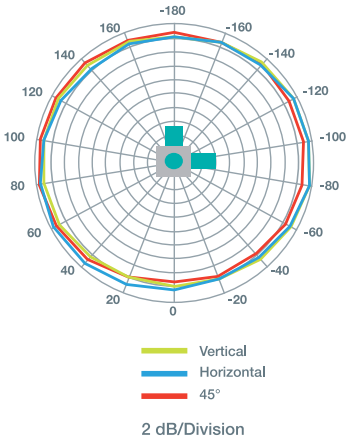
MECHANICAL CHARACTERISTICS / 100 KHz - 3 GHz PROBE	
Dimension (without cable)	406 mm
Weight	980 gr
RF cable length	2 m
Connector	3N
Protection	IP 44
Conditions for use (temperature, humidity)	-10 to 50°c, 85 % humidity

ELECTRICAL CHARACTERISTICS / 100 KHz - 3 GHz PROBE	
Sensitivity at 900 MHz (Given for a spectrum analyzer sensitivity of -90 dBm) (Cable loss taken into account)	1 mV/m
Max. E-field/900 MHz	200 V/m
Isotropy at 900 MHz	± 1 dB
Isotropy at 1800 MHz	± 1,7 dB

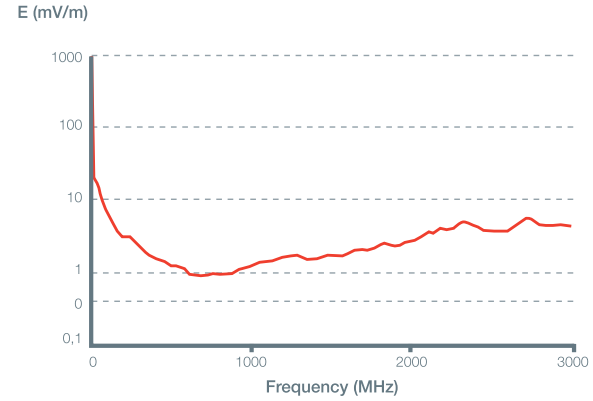
100 KHz - 3 GHz probe antenna factor



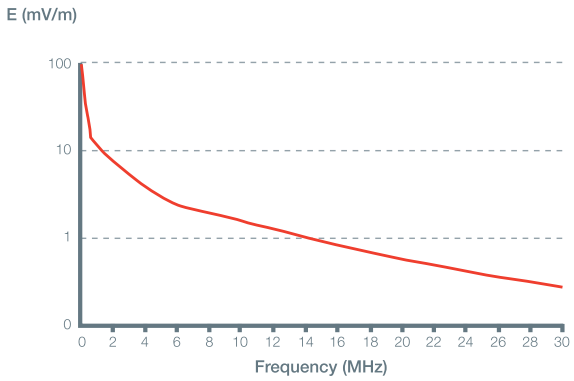
Axial Isotropy at 900 MHz



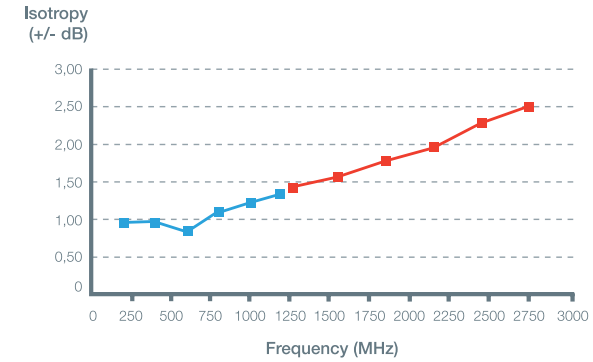
100 KHz - 3 GHz probe sensitivity without amplifier



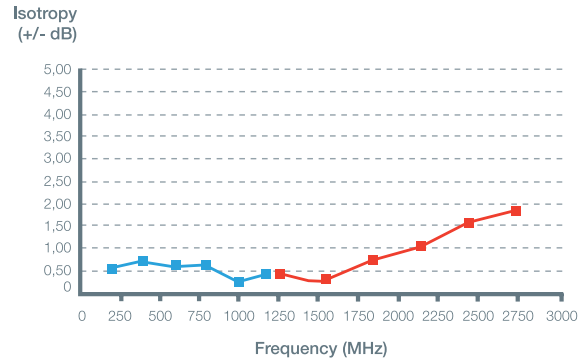
100 KHz - 30 MHz probe sensitivity with amplifier



100 KHz - 3 GHz Axial Isotropy with horizontal polarization



100 KHz - 3 GHz Axial Isotropy with vertical polarization



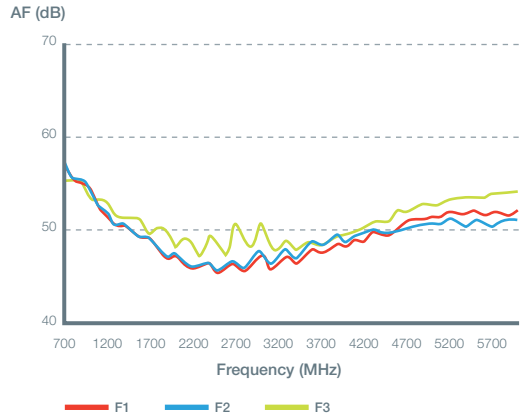
MECHANICAL CHARACTERISTICS / 700 MHz - 6 GHz PROBE

Dimension (without cable)	70 mm
Weight	800 gr
RF cable length	2 m
Connector	3N
Protection	IP 44
Conditions for use (temperature, humidity)	10 to 50°c, 85 % humidity

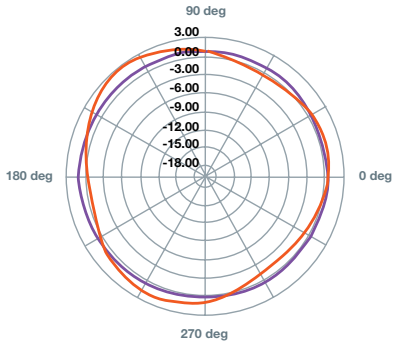
ELECTRICAL CHARACTERISTICS / 700 MHz - 6 GHz PROBE

Sensitivity at 900 MHz (Given for a spectrum analyzer sensitivity of -90 dBm) (Cable loss taken into account)	3,5 mV/m
Max. E-field/900 MHz	200 V/m
Isotropy at 900 MHz	+/- 1,6 dB
Isotropy at 1800 MHz	+/- 2,5 dB

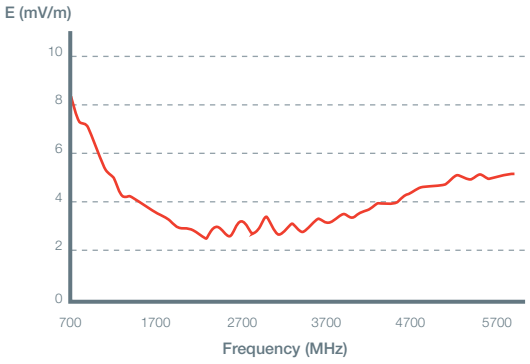
700 MHz - 6 GHz probe antenna factor



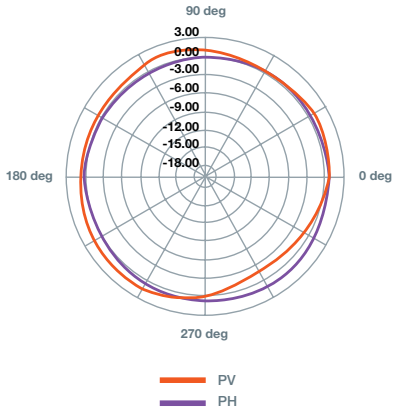
Axial Isotropy 3.6 GHz



700 MHz - 6 GHz probe sensitivity



Axial Isotropy 5.6 GHz



Perform isotropic measurements without changing the position of the probe

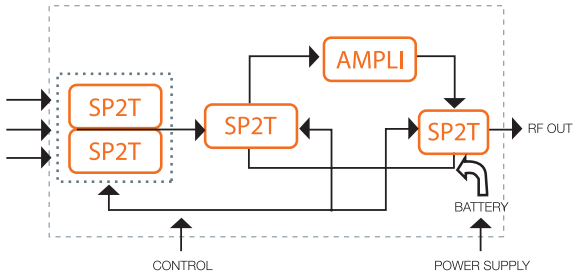
INSITE Free System performs a measurement for each axis and all predefined bands. The power value measured on each axis is then converted into field value.

FOR EACH BAND

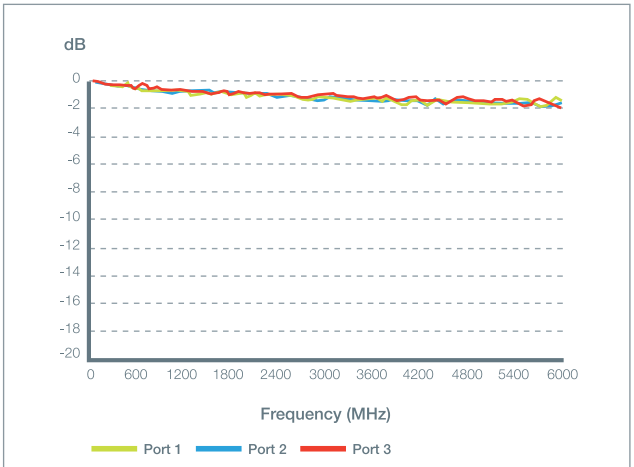
One scan for each axis	X 	Y 	Z 
Conversion in field value	[E] (dB V/m) = Pmes (dBm) – 13 + **Ilossl** + **AF** (dB m-1) **AF:** Antenna Factor **loss:** cable loss, switch loss		
Isotropic value calculation	$[E_{TOT}]$ (V/m) = (**[Ex]² (V/m)** + **[Ey]² (V/m)** + **[Ez]² (V/m)**)$^{1/2}$		

SWITCH BOX CHARACTERISTICS

Dimensions	100 mm x 200 mm x 50 mm	Frequency range	100 KHz – 6 GHz
Battery life	4 hours	Immunity	200 V/m
Protection	IP55	Frequency range amplifier	100 KHz – 30 MHz
N connections	Output : 1 female Input : 3 female	Max power input for amplifier	-30 dBm
Interface	USB	Amplifier gain	32 dB
Working conditions	-10 to 50°C, 85% humidity	Intermodulation	-30 dB @ -50 dBm -40 dB @ -60 dBm

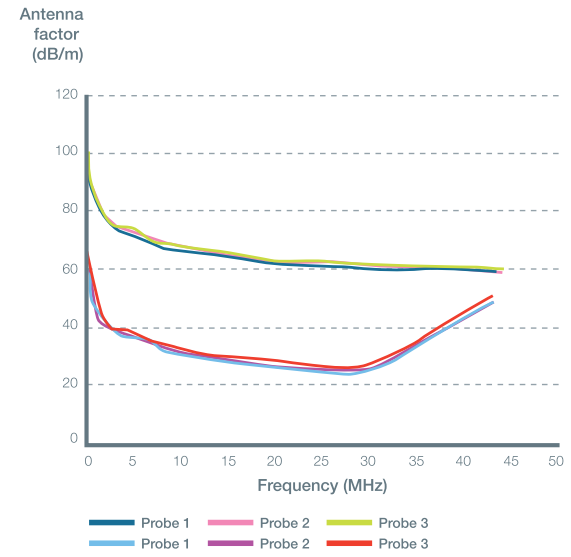


Sketch of the switch

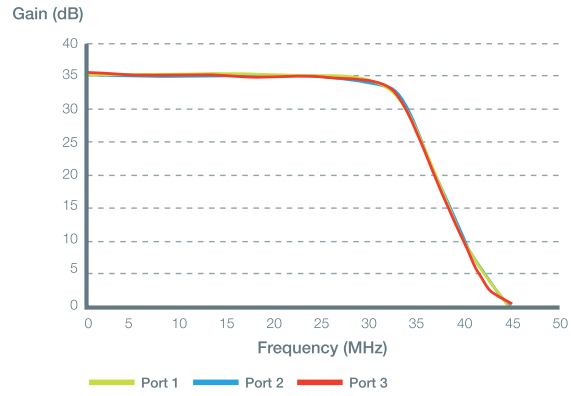


Transmission loss

Antenna factor with or without amplifier



Amplifier gain



HARDWARE REQUIREMENTS

Computer	Processor 2 GHz
Cable link*	3 USB Ports
Operating system	XP / WIN7 / WIN8
Memory	2 GB RAM
Free space	500 MB free space on hard disc

* Serial port, USB, Ethernet or GPIB may be necessary depending on the analyzer

About Microwave Vision Group (MVG)

Since its creation in 1986, The Microwave Vision Group (MVG) has developed a unique expertise in the visualization of electromagnetic waves. These waves are at the heart of our daily lives: Smartphones, computers, tablets, cars, trains, planes - all these devices and vehicles would not work without them. Year after year, the Group develops and markets systems that allow for the visualization of these waves, while evaluating the characteristics of antennas, and helping speed up the development of products using microwave frequencies.

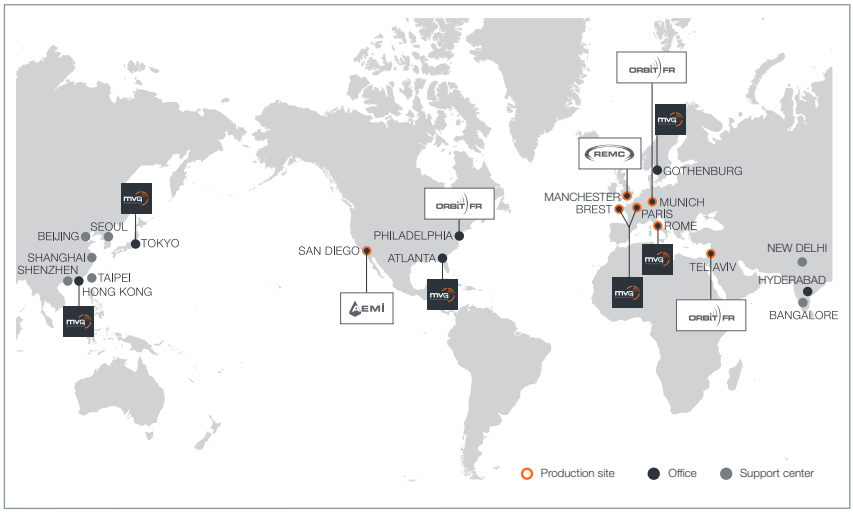
The Group's mission is to extend this unique technology to all sectors where it will bring strong added value. Since 2012, MVG is structured around 4 departments: AMS (Antenna Measurement Systems), EMC (Electro-Magnetic Compatibility), EIC (Environmental & Industrial Control), and NSH (National Security & Healthcare).

MVG is present in 12 countries, and generates 90% of sales from exports. The Group has over 350 employees and a loyal customer base of international companies.

MVG's customer satisfaction program

The RF Safety/EMF products are designed and produced by MVG's dedicated center based in Brest. The local team is supported by a network of regional offices in North America, Asia and Europe. Our presence close to our customers is essential to ensure high quality sales services.

MVG is ISO 9001:V2008 certified.



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