narda
Safety Test Solutions
an L3 Communications Company
http://www.narda-sts.it

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User's Manual

PMM 8056

RF SAFETY ANALYZER

SERIAL NUMBER OF THE INSTRUMENT
You can find the Serial Number on the back cover of the instrument.
Serial Number is in the form: 0000X00000.
The first four digits and the letter are the Serial Number prefix, the last five digits are the Serial Number suffix. The prefix is the same for identical instruments, it changes only when a configuration change is made to the instrument.
The suffix is different for each instrument.

NOTE:

If the instrument is used in any other way than as described in this Users Manual, it may become unsafe

Before using this product, the related documentation must be read with great care and fully understood to familiarize with all the safety prescriptions.

To ensure the correct use and the maximum safety level, the User shall know all the instructions and recommendations contained in this document.

This product is a **Safety Class III** and **Installation Category III** instrument according to IEC classification and has been designed to meet the requirements of EN61010-1 (Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use).

This product has a **Pollution Degree II** normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

The information contained in this document is subject to change without notice.

KEY TO THE ELECTRIC AND SAFETY SYMBOLS:

You now own a high-quality instrument that will give you many years of reliable service. Nevertheless, even this product will eventually become obsolete. When that time comes, please remember that electronic equipment must be disposed of in accordance with local regulations. This product conforms to the WEEE Directive of the European Union (2002/96/EC) and belongs to Category 9 (Monitoring and Control Instruments). You can return the instrument to us free of charge for proper environment friendly disposal. You can obtain further information from your local NARDA Sales Partner or by visiting our website at www.narda-sts.it .

Warning, danger of electric shock

Earth

Read carefully the Operating Manual and its instructions, pay attention to the safety symbols.

Unit Earth Connection

Earth Protection

Equipotential

KEY TO THE SYMBOLS USED IN THIS DOCUMENT:

DANGER — **The DANGER sign draws attention to a potential risk to a person's safety. All the precautions must be fully understood and applied before proceeding.**

WARNING — **The WARNING sign draws attention to a potential risk of damage to the apparatus or loss of data. All the precautions must be fully understood and applied before proceeding.**

CAUTION — **The CAUTION sign draws attention against unsafe practices for the apparatus functionality.**

NOTE: — **The NOTE draw attention to important information.**

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SAFETY RECOMMENDATIONS AND INSTRUCTIONS

This product has been designed, produced and tested in Italy, and it left the factory in conditions fully complying with the current safety standards. To maintain it in safe conditions and ensure correct use, these general instructions must be fully understood and applied before the product is used.

- When the device must be connected permanently, first provide effective grounding;
- If the device must be connected to other equipment or accessories, make sure they are all safely grounded;
- In case of devices permanently connected to the power supply, and lacking any fuses or other devices of mains protection, the power line must be equipped with adequate protection commensurate to the consumption of all the devices connected to it;
- In case of connection of the device to the power mains, make sure before connection that the voltage selected on the voltage switch and the fuses are adequate for the voltage of the actual mains;
- Devices in Safety Class I, equipped with connection to the power mains by means of cord and plug, can only be plugged into a socket equipped with a ground wire;
- Any interruption or loosening of the ground wire or of a connecting power cable, inside or outside the device, will cause a potential risk for the safety of the personnel;
- Ground connections must not be interrupted intentionally;
- To prevent the possible danger of electrocution, do not remove any covers, panels or guards installed on the device, and refer only to NARDA Service Centers if maintenance should be necessary;
- To maintain adequate protection from fire hazards, replace fuses only with others of the same type and rating;
- Follow the safety regulations and any additional instructions in this manual to prevent accidents and damages.

Declaration of EC Conformity

(in accordance with the Directives: EMC 89/336/EEC and Low Voltage 73/23/EEC)

This is to certify that the product: PMM 8056 RF Safety Analyzer

Produced by: NARDA S.r.l.
Safety Test Solution
Via Benessea 29/B
17035 Cisano sul Neva (SV) - ITALY

complies with the following European Standards
Safety: CEI EN 61010-1 – 1994 & CEI EN 61010-1/A2 – 1996
EMC: EN 55011 - EN 50082-1

This product is in conformity with the requirements of Directive EMC 89/336/EEC amended by 92/31/EEC, 93/68/EEC, 93/97/EEC.

NARDA S.r.l.

1 – General information

1.1 Documentation

The following Appendices are included in this Manual:

- A questionnaire to be sent to NARDA together with the apparatus and accessories should service be required.
- A check list of the Accessories included in the shipment.

The Manual includes the description of the accessories of the system for the measurement of electromagnetic fields.

1.2 PMM 8056 Introduction

PMM 8056 is a pocket-size apparatus for measuring electric and magnetic fields for electrosmog.
The system consists in a complete compact body of isotropic electric and magnetic field probes, a display, non rechargeable internal batteries, three simple function buttons that enable different actions and settings to be made, according to the menu selected, and an infra-red serial interface.
The incorporated alarm indicator informs the user when there are fields exceeding the set limit.

NOTE

The measurements taken by this apparatus are influenced by the presence of the human body. Therefore, to take proper measurements, the user is advised not to to grip the apparatus.

1.3 Standard accessories

The standard accessories included with PMM 8056 are the following:

- Battery 9V – 1200mA/h;
- Carrying Case;
- Serial Cable with Infra-red Adapter (2m long);
- Earphone;
- Program Disk for Data Transfer to the PC;
- User's Manual;
- Calibration Certificate;
- Return for Repair Form.

1.4 Optional accessories

The following accessories may be ordered separately:

- TR-02A Tripod with Swivel;
- TR-03 Mini Tripod;
- TT-01 Telescopic Support.

1.5 Spare parts

The following spare parts may also be ordered separately:

- 8056-Battery Battery 9V - 1200mA/h;
- 8056-Carrying Case Carrying Case;
- 8056-Cable Serial Cable – 2m long;
- IR232 Infra-red Adapter;
- 8056-Earphone Earphone.

1.6 Main specifications

Table 1-1 lists the specifications of PMM 8056 and of its field probes.

The following conditions apply to all specifications:

- Temperature for use must be between –10° and 40° C.

TABLE 1-1 Technical specifications PMM 8056 Safety Analyzer

Frequency Range

FLAT 6-20 Model (Flat Probes)

Electric Field

Frequency range:		3 MHz - 40 GHz	
Resolution		1% of set limit	
Sensitivity		10% of set limit	
Limits:		Population = 6V/m;	Workers = 20 V/m
Units:		% compared to the limit,	V/m
Full scale:		150% of the limit of the workers	
Overload:		300 V/m	
Accuracy, @ 20 V/m:	/	3 MHz – 5 GHz	+/- 3 dB
	{	5 GHz – 18 GHz	+6/-4 dB
	\	18 GHz – 40 GHz	+0 / -8dB

Magnetic Field

Frequency range:	30 MHz – 300 MHz	
Resolution	1% of set limit	
Sensitivity	10% of set limit	
Limits:	Population=73mA/m	Workers=243mA/m
Units:	% compared to the limit, mA/m	
Full scale:	150% of the limit of the workers	
Overload:	3 A/m	
Accuracy:		
@ 243 mA/m	30 MHz - 300 MHz	+/- 3 dB

FCC-OET 65 Model (Weighted Probes)

Electric Field

Frequency range:	3 MHz – 40 GHz
Resolution	1% of the set limit
Sensitivity	10% of the set limit
Limits:	Population and Workers :complying with OET-65
Units:	% compared to the limit,
Full scale:	225% of the limit of the workers
Overload:	400% of the limit of the workers

Magnetic Field

Frequency range:	3 MHz – 300 MHz
Resolution	1%
Sensitivity	10% of the set limit
Limits:	Population e Workers :complying with OET-65
Units:	% compared to the limit,
Full scale:	225% of the limit of the workers
Overload:	400% of the limit of the workers

TABLE 1-2 LCD Display

Fields displayed	Absolute and percentage value of the limit of the electric and magnetic field (In the Heavy Probe version, only the % value is displayed), Average value of the last 6 minutes
Time	Internal clock in real time
Graphic bar	The analogue bar displays the field in real time with respect to the set limit

TABLE 1-3 Measuring Function	
Measuring Function	
Limits	Can be selected: level for the population or for the workers
Alarm	The Beep is enabled when the field is: between 50% and 75% of the limit between 75% and 100% of the limit over 100% of the limit
Functions	actual value or average value
Average time	6 min
Averaging mode	AVG
Sample rate	1 measurement/sec
Data acquisition (Logger)	1 reading/sec, 1 reading/min of the top value, average on 6 min with resolution of 1 min (manual mode), average on 6 min with resolution of 1 min (continuous mode)
Internal memory	up to 2000 measurements
Auto-OFF	disabled, 8 and 24 hours

TABLE 1-4 General specifications	
General specifications	
Output	LCD display two 16 character lines
Internal battery	Non rechargeable 9V PP3
Operational time	> 2000 hours with display OFF; 1000 hours with display ON
Interfaces	Infra-red RS232 (downloading the data and updating the Firmware)
Software / Firmware	Up-date available via Internet at www.narda-sts.it
Autotest	Automatic when switching on for all the functions;
Conformity	With EC Directive 89/336 and amendments to it
Calibration	Inside the built-in E²PROM of the probe
Operating temperature	From -10 a +40°C
Storing temperature	From -20 a +70°C
Size (WxHxD)	62 x 30 x 190 x 50 mm
Weight	185 g

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2 – To install and use

2.1 Introduction

This Chapter provides the information required for installing and using the PMM 8056 Portable Field Meter, for using the accessories referred to in Chapter 7 of this Manual.
It includes information about preliminary inspection of the apparatus, power requirements, interconnections, work environment, assembly, cleaning, storage and shipment.

2.2 Preliminary inspection

Inspect the packaging for any damage.
If the packaging or anti-shock material have been damaged, check that all the contents are there and the apparatus has not suffered any damage.

WARNING

Check that all the Accessories are there against the checklist found as a Appendix to this Manual.
Inform the carrier and NARDA about any damage that has occurred.

2.3 Work environment

The work environment of the apparatus must fall within the following range of conditions:

- Temperature From -10° to +40° C
- Humidity < 90% relative

The apparatus must be stored in a clean and dry environment, free from dust, acids and humidity.
The storage environment must fall within the following range of conditions:

- Temperature From -20° to + 70° C
- Humidity < 95% relative

2.4 To return for repair

When the apparatus or the accessories need to be returned to NARDA for repair, please complete the questionnaire appended to this User's Manual, filling in all the data that will be useful for the service you have requested.
For reducing the period of time required for the repairs, you should be as specific as possible in describing the problem. If the problem only occurs in certain circumstances, please describe in detail how the breakdown or malfunctioning happens.
If possible, it is better to reuse the original packaging; making sure that the apparatus is wrapped in thick paper or plastic.
Otherwise, use strong packaging by putting a sufficient quantity of shock absorbent material around all sides of the apparatus to ensure that it is compact and does not move around inside the package.
in particular, be very careful to protect the front panel.
Complete the packaging by sealing it tightly.
Apply a FRAGILE label to the package to encourage greater care in its handling.

2.5 To clean

Use a dry, clean and non-abrasive cloth for cleaning the apparatus.

WARNING

Do not use solvents, acids, turpentine, acetone or other similar products to clean the apparatus, in order to avoid damaging it.

2.6 To install and use PMM 8056

To install and use PMM 8056 is very easy, simply switch on the apparatus with the button on the right and begin taking measurements. By using the function buttons on the left, select the appropriate limit and make any other settings required.

NOTE

When measuring fields emitted from transmitting antennas, it is important to place the probe with the handle of the support perpendicular to the polarisation of the antenna to avoid interference with the measurement.

2.7 RF signals of dangerous fields

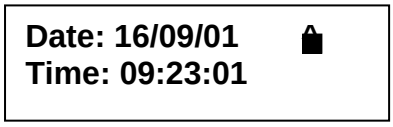
The PMM 8056 probe uses highly sensitive components.
Do not insert the probe in an electric or magnetic field greater than the threshold permitted for the probe in use.

WARNING

Whether PMM 8056 is switched on or off, damage to the internal diodes may occur when the probe is radiated by strong fields.

2.8 To check the internal batteries

Before beginning to use the apparatus and in order to have the greatest autonomy, make sure that the batteries are sufficiently charged for the duration of the measurement.
When PMM 8056 is switched on, the date and the time will be displayed and the battery symbol will appear on the right. The part coloured in black represents the charge that is still available.



WARNING

On the basis of the selected mode (display always ON or only ON for a certain period), the batteries will last for between 1000 and 2000 hours.

2.9 To replace the batteries

Remove, with a star-patterned screwdriver, the bottom cover where the thread for the tripod is found, take out the battery and pull out the connector.
Insert the new battery and reconnect the connector, paying attention to the polarity. Replace the cover and re-screw the two screws into place.

NOTE

Removing the battery causes all the settings to return to default values; after replacing the battery, re-set the appropriate parameters, including the Time.

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3 – Instructions for use

3.1 Introduction

The PMM 8056 Portable Field Meter is designed to be simple and rapid in use and, therefore, able to be used by personnel with little expertise with this kind of meter.
It is possible to pilot the entire apparatus with only three buttons. The button on the right is used to switch the apparatus on and off.
The function buttons, located on the back left hand side of the apparatus, enable the user to select the commands and all the functions offered which are displayed on the 16-character display.
The bottom button enables the function to be selected, the top button is used to select the parameters offered by the apparatus.
The apparatus is structured in the following way:

Fig. 3-1 PMM 8056

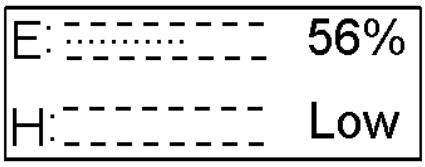
3.2 To switch on

To switch the apparatus on, press the button on the back right hand side of the apparatus; the ON button 1).
The Start Up routine will begin during which the following information, in sequence, will appear on the display:

PMM 8056
1.18 11/01

1. Revision and date of the firmware;
2. The limit used which is, by default, always Workers (level for the workers);
3. Current date and time and the status of the battery.

Once the start up procedure is terminated, the apparatus will immediately display the electric and magnetic field.
The display will be of the following type:



The graphic indicates in analog form the value of the field; next to this, the field expressed in the percentage of the selected limit is given. By pressing the top Parameters button once, the apparatus will display the absolute value of the field while, by pressing it twice, the average of the last 6 minutes will be displayed.

3.3 To switch off

To switch the apparatus off, keep the button on the right, the ON button, pressed down for at least three seconds and then let it go.

3.4 Function and Parameters buttons

All the operational modes of PMM 8056 are available by using only two buttons. By pressing the Function button twice, in quick succession, the various operational modes are displayed. By pressing in sequence the Parameters button, the various options associated with the selected function are presented.

3.5 Function button

By pressing the Function button (the bottom one) twice, in quick succession, the user enters the menu for selecting the various functions, which are the following:

1. **LIMIT**;
2. **BEEP**;
3. **Auto OFF**;
4. **LOGGER**;
5. **Display ON**;
6. **Remote Link**
7. **Date & Time**

NOTE

By pressing the Function button in sequence, all the various choices appear, in succession, on the display; having reached the last one (Date & Time), the apparatus will automatically move on to measuring the field.
Therefore, the user has press the Function button again, this time twice, in order to change any parameter in a previous function.

3.5.1 LIMIT

By entering into the **LIMIT** function, through pressing the top button of the parameters, the user can select which limit to use. The percentage value shall be calculated by using the selected limit.
The initial display will be:

LIMIT
Workers

Where the limit is fixed to the level provided for the workers. By pressing the top button for selecting the parameters, the user will be given:

LIMIT
Population

In this case, the limit is fixed at the level for the population.

NOTE

When switching the apparatus off, and then switching it on again, PMM 8056 will always give the Workers limit.
The limits may only be changed at the NARDA laboratories and, in some cases, modifications to the hardware are required.

3.5.2 BEEP

The internal acoustic beep may be enabled or disabled.
The choices are:

1. **BEEP Key**: a beep is emitted every time a button is pressed
2. **BEEP OFF**: the beep is always off
3. **BEEP Key, Alarm**: a beep is emitted both when a button is pressed and when the field exceeds the alarm threshold.

3.5.3 Auto OFF

This function defines the time the apparatus will stay on after the last time the user presses a button. The function is disabled during the Logger mode. The various options that can be obtained by pressing, in sequence, the top button of the selection of the Parameters, are the following:

1. **Auto OFF disabled**: the apparatus stays on all the time until the ON button is pressed;
2. **Auto OFF 8 Hours**: the apparatus switches itself off after 8 hours;
3. **Auto OFF 24 Hours**: the apparatus automatically switches itself off after 24 hours.

3.5.4 LOGGER

In **DATA logger** mode, the user can store the data of the measurements taken and save them in a file.
The options are:

1. **1 s Peak**: reading of the electric and magnetic field every second;
2. **1 Min Peak**: reading of the highest value of the electric and magnetic field every minute;
3. **6 Min AVG Cont**: reading of the electric and magnetic field for the average value every 6 minutes; the data acquisition process continues indefinitely until the stop is given. The memory is filled each 1 minute to give the average carried over.

Let us suppose that the Logger begins at 15:42

DURATION OF LOGGER	AVERAGE VALUE CALCULATED	AVERAGE OBTAINED AND STORED
15:42 – 15:43	X_1	X_1 / 1
15:43 – 15:44	X_2	$(X_1+X_{2)}$ / 2
15:44 – 15:45	X_3	$(X_1+X_2+X_3)$ / 3
15:45 – 15:46	X_4	$(X_1+X_2+X_3+X_4)$ / 4
15:46 – 15:47	X_5	$(X_1+X_2+X_3+X_4+X_5)$ / 5
15:47 – 15:48	X_6	$(X_1+X_2+X_3+X_4+X_5+X_6)$ / 6
15:48 – 15:49	X_7	$(X_2+X_3+X_4+X_5+X_6+X_7)$ / 6
15:49 – 15:50	X_8	$(X_3+X_4+X_5+X_6+X_7+X_8)$ / 6
15:50 – 15:51	X_9	$(X_4+X_5+X_6+X_7+X_8+X_9)$ / 6

4. **6 Min AVG Man**: reading of the electric and magnetic field for the average value over 6 minutes; PMM 8056 continually captures the data, it calculates the average value over 6 minutes updated every minute (the average carried over). When the user uses the manual command, PMM 8056 stores the average calculated at that moment, corresponding to the value relating to the full 6 minutes prior to pressing the button. The generated files contain both the value of the E-field and the H-field with the following data:

- the mode used by the Logger
- the date the measurement started
- the time the measurement started
- the duration of the measurement
- the average value
- the value of every single datum stored at a very precise time (hh:mm:ss)

Acquisition Mode:
Start date:
Start time:
Total duration::

Average _____ V/m, _____ H

Time	V/m	H
__:__:__	____	____
__:__:__	____	____
__:__:__	____	____
__:__:__	____	____
__:__:__	____	____
__:__:__	____	____
__:__:__	____	____

3.5.5 Display ON

To reduce battery drain, PMM 8056 provides the following options:

1. **Display ON ALL Time long**: the display is always on;
2. **Display ON 15 seconds**: the display stays on for 15 seconds;
3. **Display ON 1 minute**: the display stays on for 1 minute
4. **Display ON 30 minutes**: the display stays on for 30 minutes

NOTE

Once the display is off, by pressing any of the three buttons, the display will light up again for the programmed time.
The display will also light up every time an alarm is exceeded.

3.5.6 Remote Link

The user can download the stored data or the data updating the firmware of the apparatus through the infra-red port. To communicate with the apparatus, enable the internal port. Entering the **Remote link** function, select either:

1. **Disabled**: the port is turned off (low drain on the batteries)
2. **Enabled**: the IR (infra-red) port is turned on.

NOTE

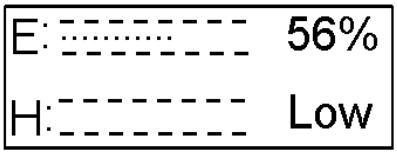
After several seconds during which the IR port is not used to download data, the apparatus will automatically become Disabled.

3.5.7 DATE & TIME

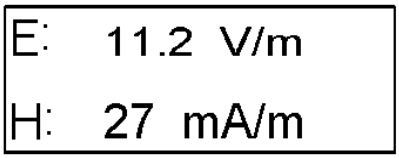
Entering in this function, the user can change the date and the time. The data are changed by pressing the ON button.

3.6 To take measurements

Once the various functions and relative parameters have been set up, the value of the electric and magnetic fields appear on the display of the apparatus.
The main display will be of the following type:



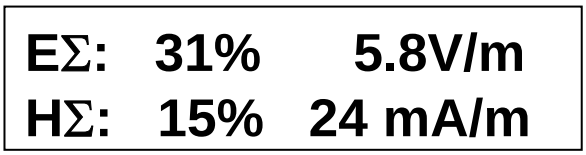
In this example, if the limit chosen were 20V/m, 56% indicates that the field is 56% of 20V/m. By pressing the Parameters button (the first on the top at the back on the left), the absolute value of the field can be displayed.
A typical display is:



NOTE

The value of the magnetic field does not always reflect the H=E/377 equation because it may be in the situation of a Near Field, where this formula is not applicable and the feedthrough band of the E and H probes is also different.

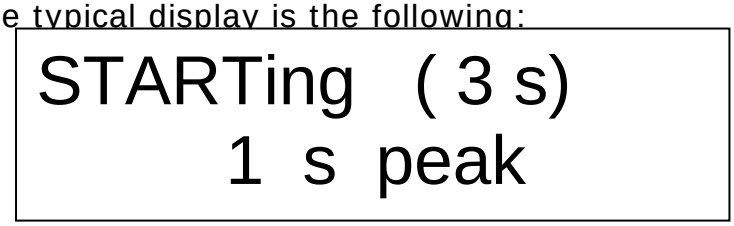
By pressing the Parameters button once again, the apparatus displays the average of the last 6 minutes.
The typical display is the following:



3.6.1 To start the LOGGER

Once the desired parameters have been set (1s peak, 1 min peak, manual or average 6 min), press the Function and the Parameters buttons at the same time to begin the data acquisition process.
The buttons must be held down for at least 3 seconds before the function is activated. If the buttons are released before this, acquisition will not begin and it will be necessary to start over again.

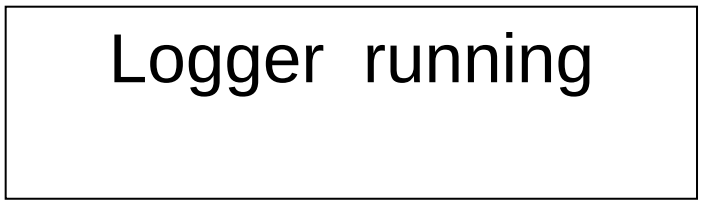
The typical display is the following:



Whilst the two buttons are being pressed down, the time for starting the Logger is counted down on the display until it reaches the value 0.

From this moment on, the data logger will acquire the data and it will no longer be possible to vary the setup until it stops.

The initial message of the data logger will be:



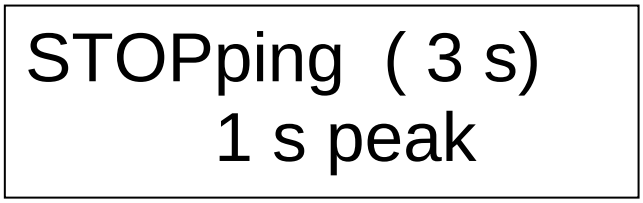
NOTE

By activating the Function button, the following message will appear, which informs the user that it is impossible to change the parameters of the measurement:

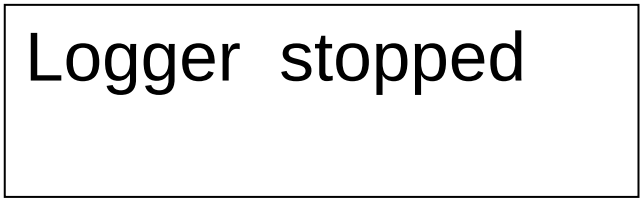
Therefore, the user must stop the acquisition before setting up a new set-up.

3.6.2 To stop the LOGGER

To stop the acquisition in course (data logger ON), press both the Function the Parameters buttons at the same time for at least 3 seconds. The following type of display will appear:



When the data logger has effectively been stopped, the following message will appear:



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4 – Applications

4.1 What is elettrosmog?

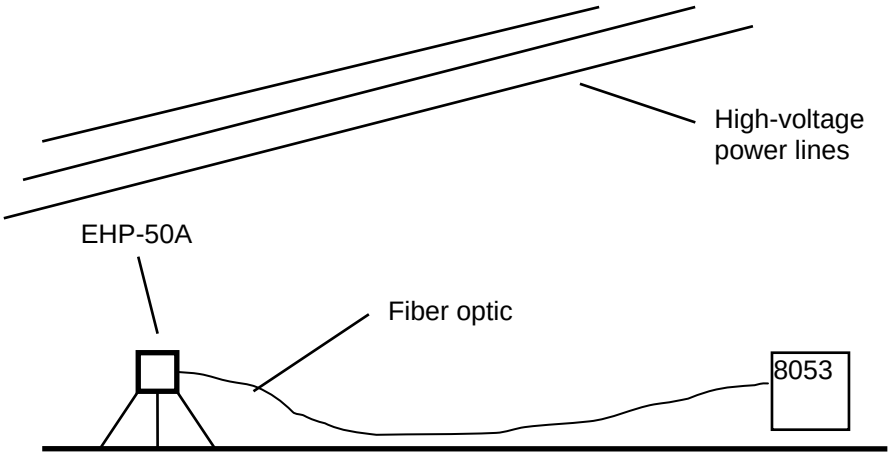
Electrosmog is a popular tem used to describe any phenomenon or problem associated with artificially generated electric or magnetic pollution.
Any electric or electronic device may cause an environmental risk.
All motors, electric power stations, AM or FM broadcasting transmitters, TVs, electric ovens, manufacturing machinery, cellular telephones and stations can generate potentially hazardous electric or magnetic fields.

4.2 Comments on the risks

Any one of us, both at work and elsewhere, can be exposed to sufficiently strong fields to be harmful to our health.
Various studies throughout the world confirm the risks involved in being radiated by strong electric or magnetic fields. A great deal has been written on the subject and doctors agree with these studies.
In fact, IEC, CENELEC and many national organisations are currently taking electrosmog and its potential consequences into consideration.
New standards are in the phase of being drafted and applied for protecting workers and citizens all over the world.

4.3 Measurements of power distribution lines

All high voltage power systems have the potential for generating hazardous electric and magnetic fields. PMM 8056 is not suitable for taking low frequency measurements. Therefore, we recommend that the user uses PMM 8053 with the EHP-50A Analyser or the HP-050 magnetic field probe. With these devices, the electric and magnetic strength of these fields can be measured. The following is the recommended configuration:



Thanks to the spectrum analysis function of EHP-50A, the user can store only the values given by the high voltage power lines, eliminating other undesired frequencies from the measurement.

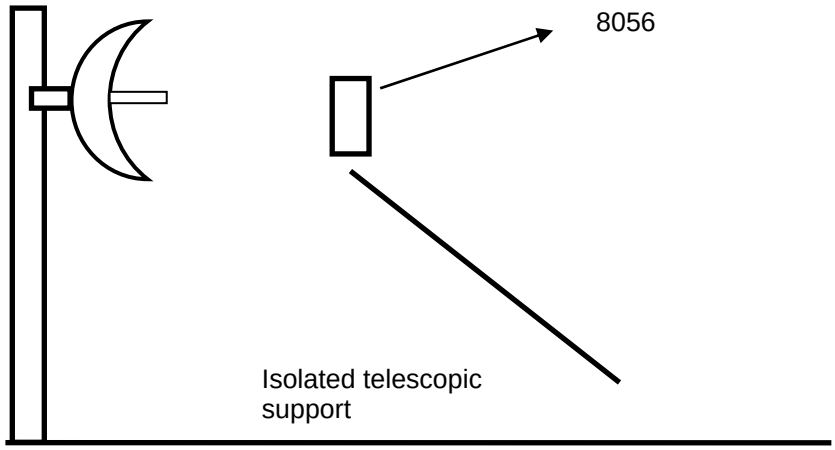
Furthermore, with the xxxDef LP mode, the user can carry out acquisitions over extremely long periods of time.

NOTE

To have maximum sensitivity in the measurement (<10 nT), set the analyser in the highest mode.

4.4 Measurements of telecommunications transmitters

Nowadays public and private transmitting stations cover virtually the entire country. Unless protective measures are taken, these high power-transmitting stations may be a potential risk for those who live nearby to them or who are involved in work on their service and maintenance.
Thanks to its light weigh and acoustic alarm feature, PMM 8056 can easily be used to monitor these electromagnetic fields to ensure that they do not exceed safety thresholds.
If the strength of a field in the vicinity of a transmitter needs to be measured, we recommend that the user use the telescopic support in order to stay at a safe distance from the potentially dangerous field. Bring the probe close to the radio station and listen to the buzzer of PMM 8056. When it begins to buzz, it means that the highest field admitted has been reached. Via the telescopic support, move the probe all around the area involved in the measurement in order to store the data.



NOTE

When measuring fields emitting from transmitting antennas, it is important that the measuring apparatus is at a distance from the body of the person taking the measurement. Place the apparatus on a suitable wooden tripod like PMM TR-02A or use the TT-01 telescopic support.

4.5 Spatial average

When fields that may radiate human beings are being measured, different measurements from different heights off the ground must be taken. The field may vary suddenly from the ground to the position higher up (for example, up to 2 m).
With PMM 8056 the internal logger can be used to carry out a spatial measurement which can then be downloaded into the PC where the average value will also be given.

4.6 Long-term acquisition

When a long-term acquisition is required, the Logger function can be used, which enables up to 2000 measurements to be stored.

NOTE

During every acquisition, PMM 8056 displays the instantaneous values of the electric and magnetic field and the average of the last 6 minutes.

5 - Data Transfer
8056 Logger Interface

5.1 Introduction

PMM 8056 offers a simple and user-friendly method for transferring the acquired data to a Personal Computer (PC). This Chapter provides all the information necessary for transferring the data with ease.

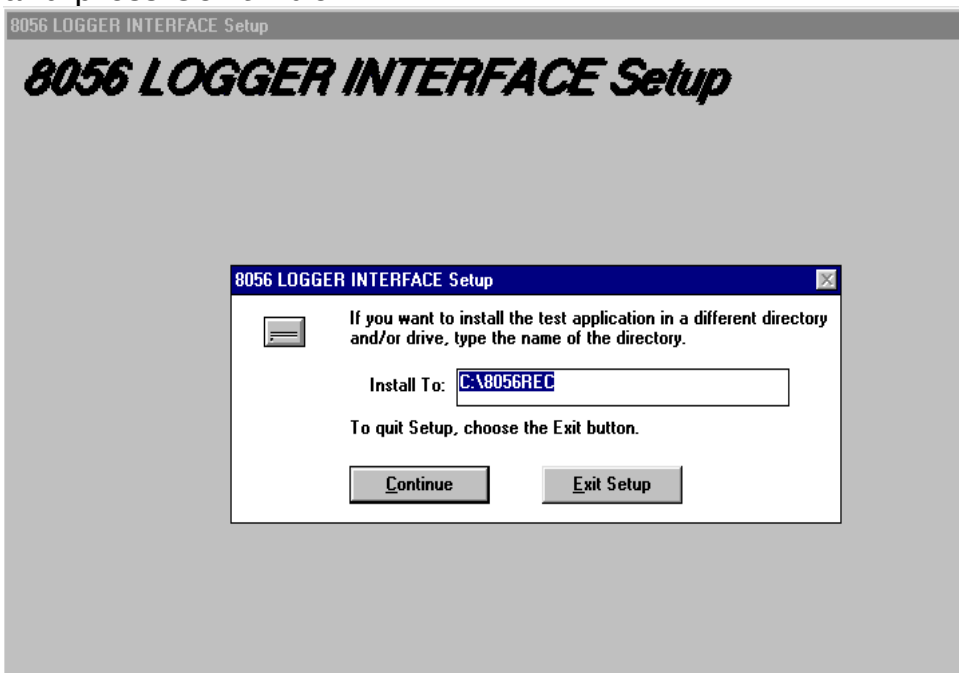
5.2 System requirements

For the software to operate properly, the user's Personal Computer should be equipped with the following:

- 486 or Pentium processor
- 16 Mb of RAM
- At least 2 Mb of free space on the hard disk
- 1 free serial port
- Windows™ 95/98 Operating System

5.3 To install the software

The software must be installed before connecting PMM 8056 to the PC. Insert the software disk into the drive, open Program Manager and run the **Setup.exe** file.After a few seconds the program will ask the user to chose the directory in which he wishes to install it. The default directory proposed by the program is **8056REC**.To install the program in a different directory, type in the new name and press **Continue**.



NOTE

During installation, the program will install several system files which are necessary for it to operate properly; if these files have already been loaded during previous installations, the following window will appear:

In this case, press **IGNORE** to continue.

NOTE

In some cases, a message may appear informing the user that it is not possible to copy the SETUP1 file. Go to the WINDOWS directory and rename the existing file with any other name of your choice and start the installation over again.

When installation is complete, the software displays a window which informs the user that the program has been successfully installed. Press **OK** to continue.

5.4 Icon of the 8056 LOGGER INTERFACE software

Once installation is complete, Program Manager displays the program's icons.
The Update Firmware program of PMM 8056 will be installed together with the data transfer program.
Select and press **8056 LOGGER INTERFACE** twice to run the data transfer software.

5.5 To install the hardware

Connect the RS232 cable, supplied with PMM 8056, to a free RS232 port of the PC; connect the infra-red module to the other extremity and place it close to the apparatus. Then carry out the following procedure:

- Start the PMM 8056 Logger interface software;
- Switch PMM 8056 on;
- Place the IR module close to the led of PMM 8056 (about 1-2 cm away from it); the white led of the module should be facing the black led of PMM 8056;
- Press the Function button twice;
- Continue to press the Function button until the Remote link is found;
- With the Parameters buttons, activate Enabled.

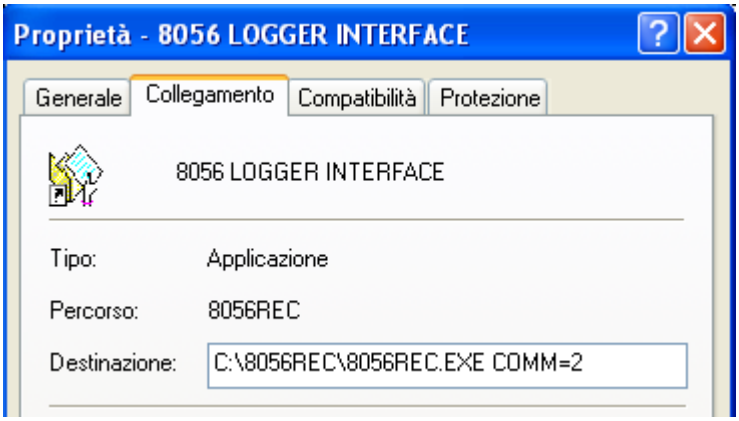
NOTE

Usually the program automatically establishes the connection on the first RS232 port not in use at that time, in the following order, COM1, COM2, COM3, etc.

Instead, whenever a port is tied up by a device (for example, a modem), which is not at that time active or is turned off, the program recognises that it is free and will, therefore, attempt to connect PMM 8056 to this port. In this case, it is necessary to "force" the next serial port by using the following procedure:

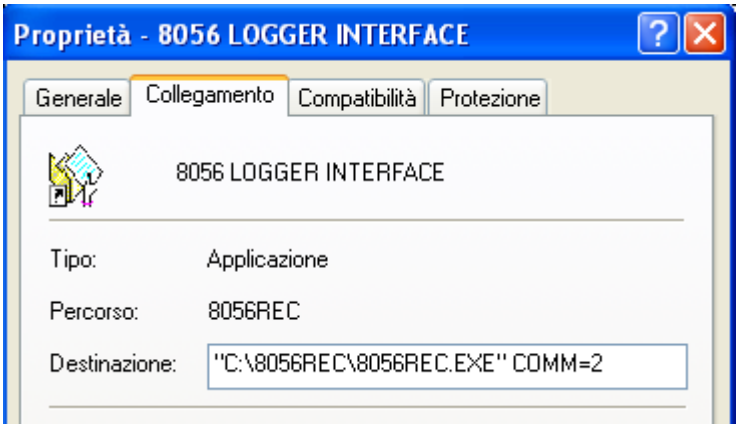
- Select the icon **8056-LOGGER INTERFACE** with the right mouse button;
- Select **Properties**;
- Add the command **COMM=N** preceded by a space (in capital letters) at the end of the Destination field where N indicates the serial port to be used; for example, if the 8056 is connected to port 2, add the command COMM=2.

NOTE **The assigned COM port nr. must be between 1 and 9.**



NOTE

- **In some operating system the Destination field is enclosed in double quotation marks (“); in this case, the command COMM=N, preceded by a space must be outside as in the example below;**

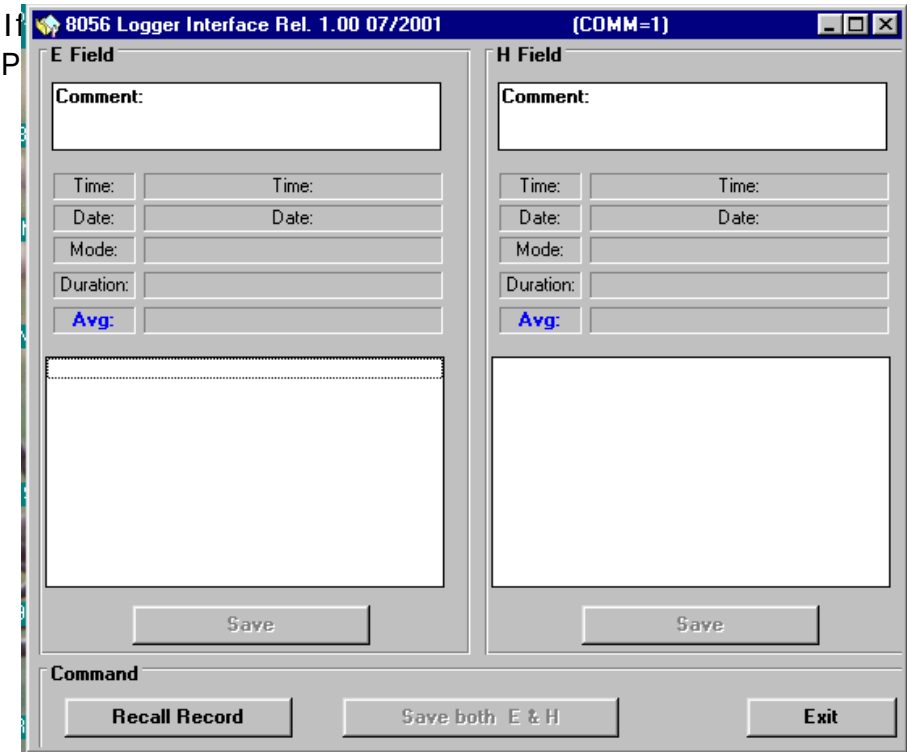


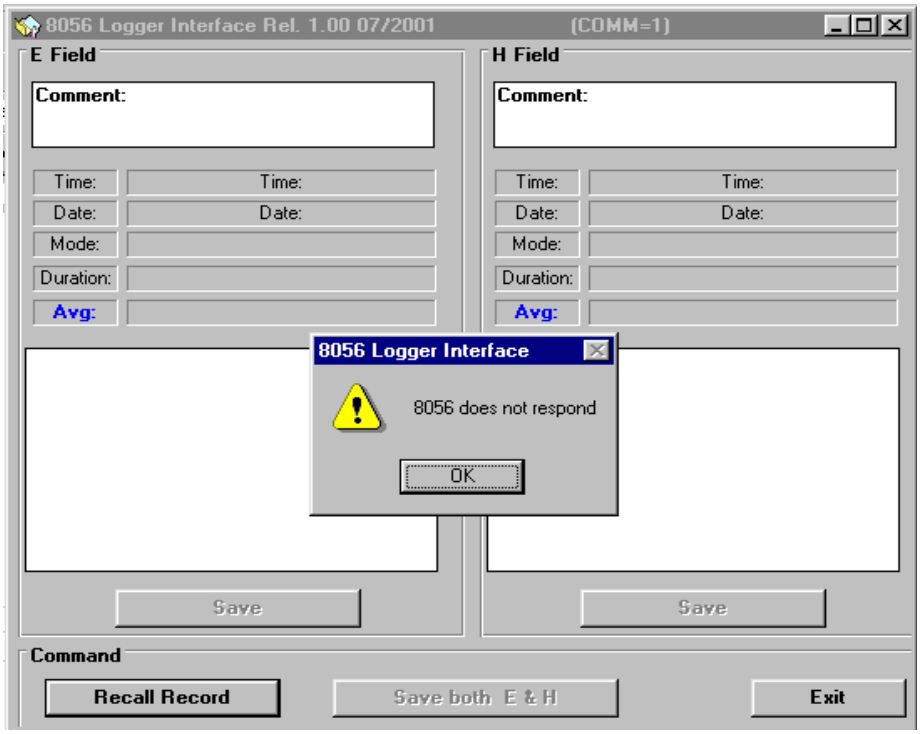
- Then confirm by selecting **Apply**

5.6 To run the transfer software

As soon as the **8056 LOGGER INTERFACE** transfer program has been run, the main window will be displayed.

If ng P



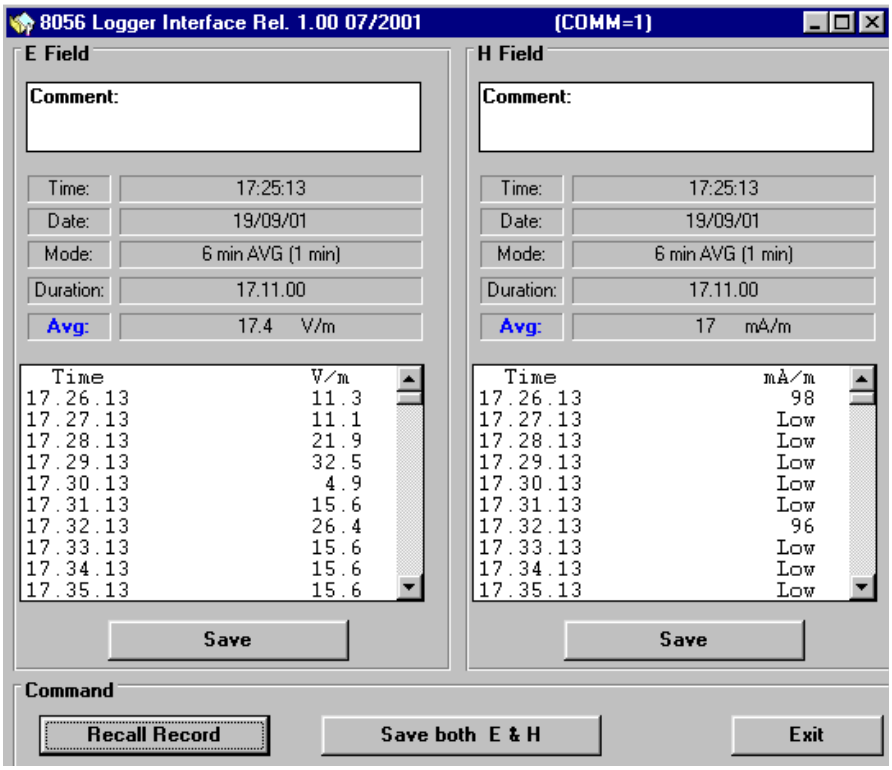


WARNING

Only use the cable supplied with the apparatus to connect the PC to PMM 8056.

5.7 To transfer data

To transfer data stored in PMM 8056 to the PC, press the virtual key **Recall Records** and wait a few minutes until data transfer is completed. When it is complete, a window similar to the following Figure will appear on the screen:



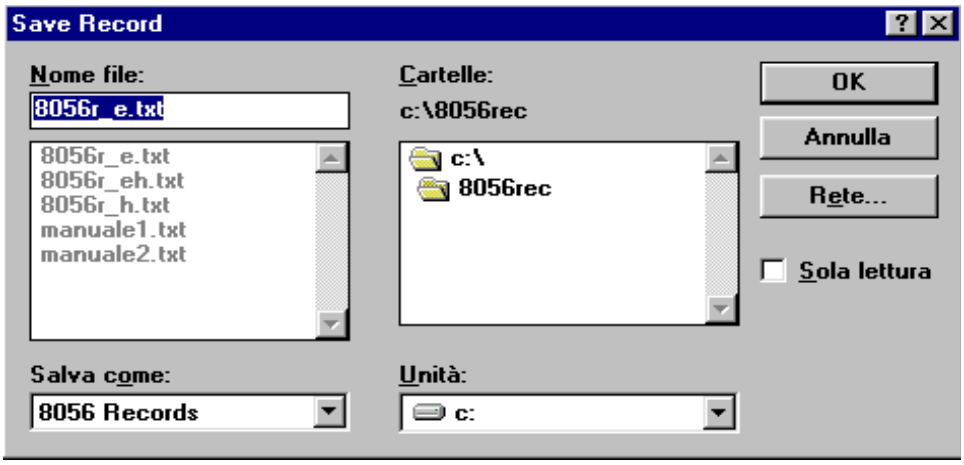
NOTE

Every record will display the following:

- The **Comment** window for adding a comment manually and saving it in the file together with the data;
- The date and time of the beginning of the measurement;
- The acquisition mode;
- The duration of acquisition;
- The average value;
- All the values measured and stored (use the up and down arrow for displaying the whole record);
- The **Save** button for saving the data on the electric or magnetic fields in a file.
- The **Save both E & H** button for saving the electric and magnetic fields in a single file.

5.8 To save data

When data needs to be handled or saved, call up the save menu by pressing the **Save** button. The program will display the following window:

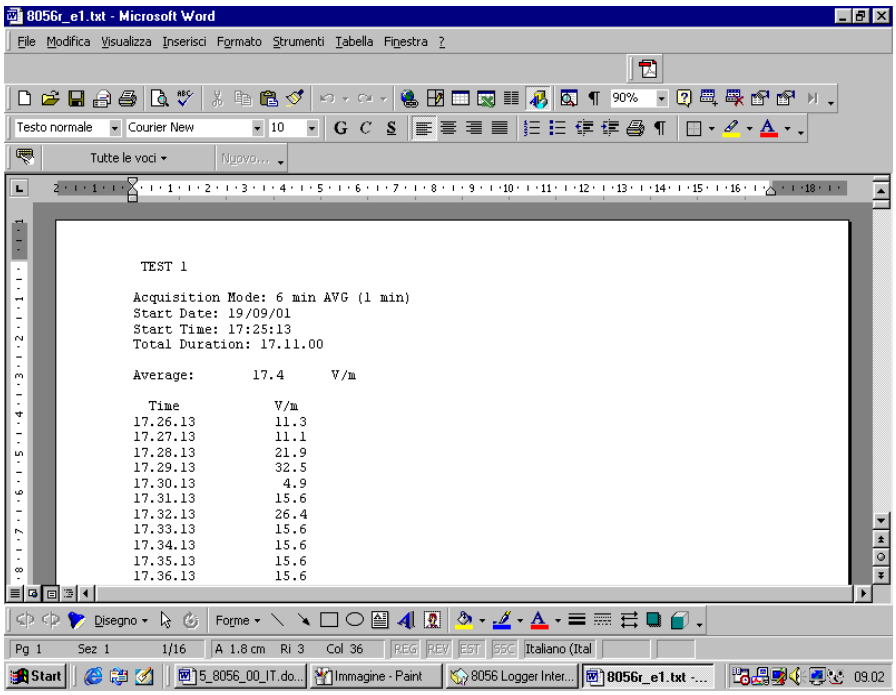


NOTE

All files saved with numeric data must have the extension: .TXT

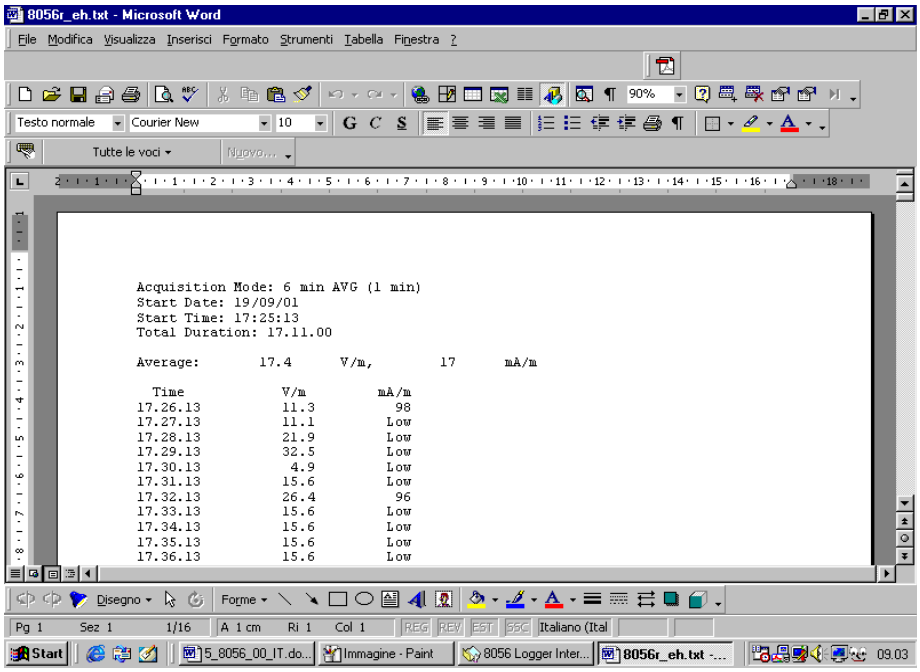
5.9 To process data with WINWORD

All saved records are ready for reading or handling with any word processing program. By using Word for Windows, the user will see a display similar to the one in the following example:



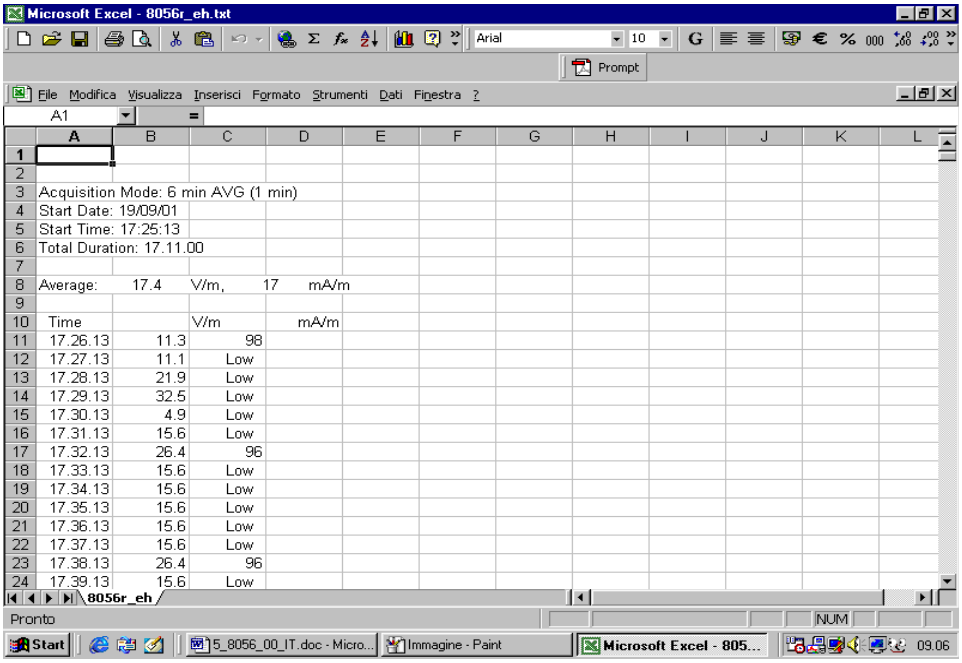
NOTE

When using Word for Windows, the format conversion TEXT ONLY (only text) must be used.
To open the file, look in the directory where the transfer software has been installed. If a file where the electric and magnetic fields are saved is called up, a display like the following will appear:



5.10 To process data with EXCEL

All saved records can be handled with EXCEL or other spreadsheet programs. In this case, it is sufficient to open the file by selecting the directory where the data has been transferred for obtaining the following display:



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6 - Updating the Firmware

6.1 Introduction

PMM 8056 contains a simple and user-friendly method for up-dating its internal firmware through a Personal Computer (PC). This Chapter provides all the information required for easy updating.

6.2 System requirements

For the software to operate properly, the user's Personal Computer should be equipped with the following:

- 486 or Pentium Processor
- 16 Mb of RAM
- at least 10 Mb of free space on the hard disk
- 1 free serial port
- Windows™ 95/98 Operating System

6.3 To install the software

The Update Firmware Program is installed together with the data transfer utility, as explained in Chapter 5 of this Manual.

6.4 Icon of the PMM 8056 software

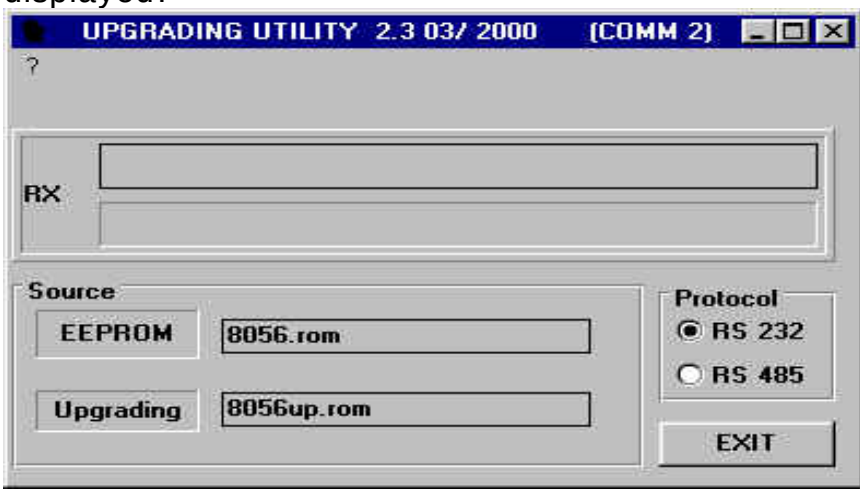
Once the software has been installed in the PC, the following window will be displayed. Press **UPDATE 8056 Firmware** twice for running the update program.

6.5 To install the hardware

Connect the RS232 cable, supplied with PMM 8056, to the infra-red module and place it close to the led of PMM 8056, connect the other extremity of the cable to a free RS232 port on the PC.

6.6 To run the update software

As soon as the updating program **UPDATE 8056 Firmware** has been run, the main window will be displayed:



6.7 To transfer data

To run the Update Firmware program, simply switch PMM 8056 on and wait until the automatic transfer is completed. At the end, if the update has been successfully performed, the following window will appear. If the update has been unsuccessful, an error message will appear.

PMM 8056 is now updated with the new version of the internal firmware.
Subsequently, when the meter is switched on again, the new version of the firmware will be displayed in the set-up window of PMM 8056.

NOTE

To obtain updating of the firmware or other programs for PMM 8056, contact the NARDA agent or download it directly from the following Web site: www.narda-sts.it.

7 – Accessories

7.1 Introduction

This Chapter provides the information required for installing and using the Accessories of the PMM 8056 Portable Field Meter.
It includes information about preliminary inspection of the apparatus, power requirements, interconnections, work environment, assembly, cleaning, storage and shipment.

The following general information is applicable to all accessories:

7.2 Preliminary inspection

Inspect the packaging for any damage.

If the packaging or anti-shock material have been damaged, check that all the contents are there and the apparatus has not suffered any damage.

Check that all the Accessories are there against the checklist found as a Appendix to this Manual.
Inform the carrier and NARDA about any damage that has occurred.

7.3 Work environment

The work environment of the Accessories must fall within the following range of conditions:

- Temperature From -10° to +40° C
- Humidity < 90% relative

The Accessories must be stored in a clean and dry environment, free from dust, acids and humidity.
The storage environment must fall within the following range of conditions:

- Temperature From -20° to + 70° C
- Humidity < 95% relative

7.4 To return for repair

When the accessories need to be returned to NARDA for repair, please complete the questionnaire appended to this User's Manual, filling in all the data that will be useful for the service you have requested.
For reducing the period of time required for the repairs, you should be as specific as possible in describing the problem. If the problem only occurs in certain circumstances, please describe in detail how the breakdown or malfunctioning happens.
If possible, it is better to reuse the original packaging; making sure that the apparatus is wrapped in thick paper or plastic.
Otherwise, use strong packaging by putting a sufficient quantity of shock absorbent material around all sides of the apparatus to ensure that it is compact and does not move around inside the package.
in particular, be very careful to protect the front panel.
Complete the packaging by sealing it tightly.
Apply a FRAGILE label to the package to encourage greater care in its handling.

7.5 To clean

Use a dry, clean and non-abrasive cloth for cleaning the apparatus and its accessories.

Do not use solvents, acids, turpentine, acetone or other similar products to clean the apparatus and its accessories, in order to avoid damaging it.

7.6 PMM TR-02A Tripod

7.6.1 Introduction

Fig. 7-1
PMM TR-02A

PMM TR02A is an Optional Accessory of the PMM 8056 measurement system which allows PMM 8056 or other Accessories of the PMM 8053 family to be easily supported during field measurements.
Each of these instruments has a fastening screw, usually placed on the bottom part of its casing, that enables it to be easily and quickly put into place through the PMM 8053-SN swivel supplied with the tripod.

The design and materials of the PMM TR-02A tripod have been specially selected to prevent it from disturbing the probes and, therefore, the measurements taken.

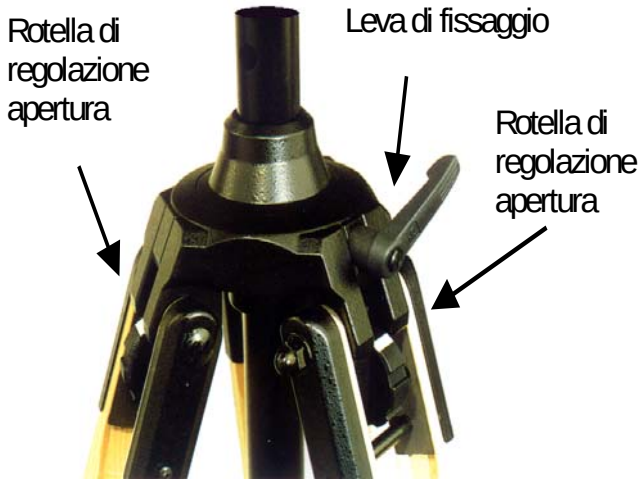
The height of the tripod can be adjusted by means of its extendable legs and it is furnished with special feet that are able adapt to all surfaces thereby improving stability. The height of its central support can also be adjusted.

It is supplied with a small protective carry-bag to make it easy to carry.

TABLE 7-1 Technical specifications of the PMM TR-02A Tripod

• **Legs**	3 legs x 3 extendable sections
• **transport size:**	76 x 12 x 12 cm
• **minimum height:**	60 cm
• **maximum height:**	180 cm
• **weight**	2,8 kg
• **load capacity**	10 kg

Details of the mounting head of the central column of the support and its adjustments:



The angle for opening each leg into three different positions can be adjusted by using the special small adjustable wheels:

- fixed opening of 20°: the White adjustment indicator is visible (as in the Figure);
- fixed opening of 45°: the Red adjustment indicator is visible;
- variable opening: no indicator is visible.

The central support can be adjusted and blocked into place by means of a special fastening lever.

Details of the swivel for fastening to the **PMM 8053-SN**:

- full height: 8 cm
- weight: 160 g
- load capacity: 10 kg

The adjustable swivel makes mounting and fastening the instrument easy as well as changing the angle in any directions via the locking knob.

Fig. 7-2
PMM 8053-SN

7.7 PMM IR-232

7.7.1 Introduction

Fig. 7-3
PMM IR-232

PMM IR232 is an accessory supplied with the PMM 8056 Portable Field Meter which enables communication between a PC equipped with a serial port and PMM 8056, via infra-red rays.

PMM 8056 is furnished with an infra-red communications port which can be seen on the right hand side of the apparatus.

By using this serial communications port, the user can update the internal software of the apparatus, or download the measurement data stored within it.

The serial cable, also supplied with the apparatus, is connected to the 9-pole connector on the back panel of IR232. The connector at the opposite end of the cable must be connected to a free serial port of the PC.

As consumption is low, PMM IR-232 is powered directly from the computer's RS232.

For proper communication between PMM 8056 and IR232, place the infra-red led of the two devices in such a way that the darker led of the one is opposite the lighter one of the other.

With this solution, there is no galvanic link between PMM 8056 and the PC.

PMM IR232 can be found in the section of the PMM 8056 package specially designed for it.

For further information regarding the use of this device, see Chapters 5 and 6 of this Manual.

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8 – Measuring electromagnetic fields

8.1 Introduction

The procedures and methods for taking measurements described here apply to sources of electromagnetic fields used in the industrial, medical, research, domestic and telecommunications sectors.

NOTE

The information given here is taken from the is based on the Guidelines for Measuring and Evaluating Electromagnetic Fields: CEI 211-7.

8.1.1 Quantities to be considered

Measurements of electromagnetic fields for protective purposes can be of two types:
1) dosimetric measurements: these are useful in assessing the energy absorbed by the human body exposed to radiation.
2) exposure measurements: these are useful in assessing the quantities characterising the electromagnetic field that the body is exposed to.

8.2 Dosimetric measurements

The biological effects of electromagnetic fields are linked to the quantity of energy deposited within a biological system during exposition. The physical quantities correlated to the biological effect are the SAR and the density of the current induced within the organism. The former of the two quantities (the SAR) is generally used for frequencies higher than 10 MHz, while the density of the current is used for lower frequencies.

8.3 Exposure measurements

Usually the intensity of electromagnetic fields is measured indirectly by using the following quantities which characterise an electromagnetic wave:

- intensity of the electric field E (expressed in V/m);
- intensity of the magnetic field (expressed in A/m);
- magnetic induction B (expressed in mT), used for ELF fields;
- power density S (expressed in W/m²).

The choice of one of these three quantities depends on the characteristics of the source and the point at which the measurements are taken.

8.4 Characteristics of the sources

The main characteristics of the sources of electromagnetic fields are:

- Type of radio frequency generator, type of field emitted, output power;
- Operating frequency and any harmonic frequencies;
- Type of modulation and its characteristics;
- Type of antenna;
- Polarization.

This information is to be taken into consideration for all sources that influence the field to be measured at the point of interest.

8.5 Measurement apparatus

Electromagnetic fields can be measured in two different ways:

- broad band with devices that, within a certain range, have an independent response (sensitivity) to the frequency. These devices give no indication of the frequency of one or more sources;
- narrow band with the use of devices that give the precise indication of the frequency of the source.

8.6 General requirements

Devices for the measurement of emissions are divided into two categories:

- meters for directly measuring E or H parameters
- temperature meters.

NOTE **The apparatus must be chosen after careful analysis of the frequencies to be measured and of the E or H field values.**

The basic components of a device are:

- the probe, constituted by its sensor and transducer;
- the cables;
- the acquisition and processing unit.

8.7 Probes

Measurement probes must generally meet the following conditions:

- to respond to a single parameter and not respond in any significant way to spurious components (for example, respond to the E field, without degrading the measurement when there are magnetic fields). This means having a high rejection level.
- to be of a size that does not greatly disturb the field where the probe is;
- to have links from the probe to the measurement unit that do not disturb, in any significant way, the field where the probe is;
- how the probes behave in relation to environmental parameters needs to be understood.

8.8 Cables

The cables must:

- be used to transfer the signal from the probe to the measurement unit;
- not influence the measurement in any considerable way;
- not couple the signal with the circuitry or acquisition components.

These can be internal or there may be none at all when the probe is incorporated in the apparatus itself or when the probe is linked via fiber optic.

8.9 Measurement units

The measurement and processing units must:

- transform the signals coming from the probes into one of the quantities under consideration
- provide data in quantitative terms
- give its own data to a PC for further recording and analysis.

8.10 Broad band apparatus

These instruments are made up of the following elements:

- the electric or magnetic field probe;
- the transducer that transforms the probe's response into a signal proportional to E (or E^2), or H or (H^2);
- the cable (or better still the fiber optic);
- the measurement and processing unit.

8.11 Narrow band apparatus

This type of instrumentation is constituted by:

- the probe that responds to the intensity of the electric or magnetic field;
- the transducer that transforms the probe's response into a signal proportional to the fields to be measured;
- the cable;
- the measurement and processing unit.

8.12 Types of apparatus

Usually the apparatus is divided into the following classes:

1) diode
2) bolometric
3) thermocouple

8.13 Diode apparatus

Usually these devices are constituted by small antennas clamped to single or multiple diodes.

These devices can be of two types:
- isotropic
- non isotropic

Isotropic devices are constituted by multiple diodes with their antenna elements usually configured orthogonally for the purpose of adding up all the components of the electromagnetic wave and they allow the field value to be measured independently of the polarization and direction of the field of incidence.
Non isotropic devices usually use a diode in combination with a small antenna (dipole).

These devices do not provide an overall reading but the acquired value depends on the orientation of the probe itself. However, they can provide an indication of the direction of the polarization of the electromagnetic wave.

Diode detectors have a linear and quadratic detection region. At low input power, the output voltages are proportional to the square of the field (E^2 or H^2) and, therefore, to the power density. With an increase in the intensity of the field, the response becomes linear until it reaches saturation.

The measurement unit gives a measurement proportional to the square of the input signal and therefore of the power density.

This apparatus, obviously, also provides for the measurement of the electric or magnetic field whenever there may be a situation involving a flat wave, a condition that is not always true. These devices usually measure the value of the peak of the signal, even though they provide the effective value (RMS).
When there are amplitude modulation signals (AM), diode devices indicate the average value of the envelop of the voltage and therefore an adequate correction factor is required depending on the kind of modulation.
Diode devices, depending on their design, may be influenced by the temperature around them unless they have internal techniques for thermal compensation. Output variations with the surrounding temperature can be in the order of 1/20 of dB/°C.

8.13.1 Spurious responses

When using diode probes, possible effects due to spurious signals must be kept in mind. These include: :

- **Multiple sources**. The diodes only act as quadratic law detectors when there are small signals. If there are two or more rather strong signals, the apparatus reads a higher value than the real one.
- **Spurious modulation**. At high levels, the response of the diode changes from a quadratic law to a linear one. Therefore, when there are pulsated signals with a low duty cycle, this causes the apparatus to read a higher value that the real average level. This is very important for radar applications.
- **Sensitivity to light**. Schottky diodes, used as detectors in some probes, are sensitive to light and infrared energy. In these cases, it is advisable to take the measurements out of direct light.
- **Disturbing agents**. Field probes can be influenced by metal infrastructures or other conductors. It is, therefore, necessary to ensure that these foreign bodies are sufficiently far away from the probe.

8.14 Bolometric apparatus

These instruments measure the rising of the temperature of a thermistor due to energy cession by radio frequency. The thermistor is usually inserted as one of the elements of an electric bridge.
This method is used very little because it is extremely

8.15 Thermocouple apparatus

Generally, thin film thermocouple devices are used as detection elements. They respond very well in accordance with a proportional quadratic law to the square of the electric field.
The hot and cold junctions are so close that they are not influenced by changes in the external temperature. Their limitation arises out of the difficulty in measuring a lot of signals because overheating occurs within the thermometer which produces a great number of errors.

8.16 Spurious responses due to the apparatus

In this section, several constructive and operational situations relating to the apparatus are examined which may result in erroneous measurements caused by spurious effects.

8.16.1 Cable coupling

At frequencies lower than 1 MHz, the impedance of small dipoles considerably increases and the amount of the quantity of their resistance can come close to the resistance of the cables usually used for connection to the measurement unit. The cables themselves may then become elements that pick up and, therefore, provide an RF signal to the measurement unit which is higher than the real value.
This effect can be minimised by orienting the cables, during the measurement, in a radiant to the source or, in other words, by pointing the probe towards the energy source. The constructive solution generally recommended is to use rigid cables whose path is known. The use of flexible cables can determine the short circuiting of some of the field lines. At present, the most frequently adopted solution for linking the probe to the measurement unit is via fiber optic.

8.16.2 Thermoelectric effect on coupling cables

High impedance conductors do not generally produce uniform electric resistance over their entire length. Eventually, differences in resistance have as a consequence differences in the dissipation of power, especially when there are strong electric fields. Such thermoelectric voltage that is generated in the junctions is able to falsify the real measurement.

8.16.3 Coupling between the probe and conductors

When too close to metal surfaces, there can be direct (capacitive or inductive) coupling with the elements of the probe, despite their small size. This coupling does not relate to the RF field, which is the object of the measurement, but is often due to the low frequency fields that are present, typically those at 50 Hz due to power lines.
Keeping in mind that sensitive dipoles are about 100 mm or less, the uncertainty of the measurement due to problems with coupling can be kept within 1 dB if the following distances are maintained between the probe and any metal surface:

- 300 mm for frequencies in the 10 kHz - 100 kHz range
- 250 mm for frequencies in the 100 kHz - 3 MHz range
- 150 mm for frequencies in the 3 MHz - 10 MHz range
- 100 mm for frequencies > 10 MHz

8.16.4 Static fields

The elements of the probe are at high impedance and the input circuits of the measurement unit have a high gain. Therefore, every mechanical movement of the probe can increase or decrease the reading of the field to be measured. For this reason, it is advisable to place the probe in a stable position.

8.16.5 Outside bandwidth responses

Usually outside bandwidth frequencies for electric field probes have little influence on the measurement.
On the contrary, magnetic field probes can have outside bandwidth resonance frequencies that can considerably falsify the field measurement.

8.16.6 Calibration of the apparatus

All the apparatus used for measuring must have a Certificate of Calibration in course of validation.
A list of simple steps to take in checking that it is operating are set out in the following:

8.17 Measurement procedures

Measurement procedures must follow a protocol that enables the maximum information to be gathered in the various phases, for the purpose of minimising:

- risks for the technician taking the measurements who must not be exposed to dangerous fields
- measurement errors
- interference
- damage to the apparatus.

8.17.1 Preliminaries

Before beginning to measure potentially dangerous electromagnetic fields, it is important to determine the greatest possible number of characteristics known about the sources and their probable propagation.
This knowledge will result in a better assessment of the distribution of the field in terms of the best choice of the apparatus and test procedures.

Checking the source and its characteristics may include the following data:

- type of generator and power generated
- frequency or frequencies of the carrier(s)
- characteristics of the modulation
- polarization of the transmitting antennas
- duty cycle, width of the impulse and the frequency of repetition of impulse transmissions
- type of antenna and its properties (gain, physical dimensions, lobes of radiation, etc.)
- the number of sources including every signal outside the bandwidth of the probe being used.

In evaluating propagation, the following should be kept in mind:

- the distance between the source and the measurement point
- the existence of absorbent, reflecting or deviating objects, capable of influencing the intensity of the field

With the characteristics defined above, it is possible to estimate the intensity of the fields to be measured and, therefore, to start measuring by using, to begin with, the least sensitive probe (to avoid overheating the probe and, therefore, damaging it), substituting it subsequently with a more sensitive one.
If the field to be measured comes from an intentional source (transmitter), it is necessary to evaluate the major lobe of radiation.
If the measurement is taken in order to identify possible sources of loss, empirical measurements should be taken by initially using the least sensitive probe operating at a fixed distance from the source and moving the probe itself around the surface of the source of the loss.

8.17.2 Near fields and far fields

Before beginning the measurement, it is necessary to define the extension of the region of the near field and the far field relating to the source under examination.
In the zone of the near-reactive field (that is, close to the antenna) the measurements of the intensity of the field are suspect due to serious errors in measurements.

For distances between $\lambda/2$ and $D^2/2\lambda$, where D is the largest dimension (height or width) of the antenna, including all its reflecting or directing), the field is called near-radiative field. In this case, the electric and magnetic components of the field to be evaluated must be measured separately.

After these distances, a zone of the far field is found where it may be enough to evaluate only one of the two quantities.

8.17.3 Operational testing of the measurement apparatus

Several simple checks enable measurements to be made with confidence that the results obtained are accurate:

- check that the probe is working properly
- if the probe is isotropic, check that the reading is independent from the orientation of the probe
- change the direction of the cables of the probe if these are flexible
- if possible, compare the measurements with a second device
- compare the reading on the apparatus with an approximate theoretical calculation
- repeat the tests after the reading has been ascertained, to show that no damage has been inadvertently done to the apparatus while in use.

8.17.4 Disturbed fields

Exposure limits always refer to undisturbed fields, that is, without the presence of the human body.
Therefore, measurements have to be taken without the user disturbing the measured field.

Always use an optical repeater and a fiber optic to distance the probe from the measurement unit in the user's possession or manage the measurement automatically through a personal computer that collects the data furnished by the measurement unit.

8.18 Measurements of far fields

The measurement of the intensities of a field in the state of a linearly polarized flat wave, whose source, position, frequency and direction of the polarization are known, can be taken by using one of the devices described above, keeping in mind that the limitations that each individual device may have.
Temporal and spatial distribution of the measurements must describe the pattern of the fields.
When single measurements are taken rather than continuous monitoring, at least eight points for a uniformly distributed wave length must be examined.
During the mounting or fastening of the antenna or probe, care must be taken to avoid reflections or alterations in the field due to the supports of the instruments or to the user's body. The cables must, as far as possible, be perpendicular to the electric field wave in order to avoid errors in measurement due to coupling the field with the cables that link the probe to the measurement unit.

8.18.1 Initial measurements

Initial measurements must be taken at the height of one meter from the ground, or 1 meter from the level of the feet, if the area of interest is above ground level.
If the radiant source is a very powerful antenna, the field close to the ground will depend on the height because of ground reflections.
The measurement of these fields distributed within the space must be measured if they are of interest. In an extreme case, it may be necessary to take measurements from ground level up to a height of 2 meters, in the points where people could be present.

8.18.2 Multiple sources

When fields emitted from more than one source with unknown characteristics have to be measured, a broad band isotropic probe is needed. Having to consider phenomena of stationary waves and the interaction of multiple fields, it is necessary to take measurements in the volume of the space of the zone of interest.
It is advisable to use an optical repeater and, whenever this is not possible, to ensure that the cables of a probe linking it to the measurement unit are high impedance.
This solution will eliminate errors due to reflections and other effects of interception by the cables.
Metal cables must be oriented perpendicularly to the electric field vector keeping in mind that it is difficult to know the correct position when the polarization is not known.

8.18.3 Near radiative fields

The accurate measurement of near fields depends on whether a probe with an electrically small antenna system is available as there are high gradients in near fields and spatial resolution is critical.

If the probe is big (for example, the effective opening is bigger than a quarter of the wave length of the measured signal), it will measure a spatially indirect field. Furthermore, a small antenna system produces minimum disturbance in the measurement of the field under examination.
Unless the polarization of the field is known, an isotropic probe must be used.
The cables, the user and the measurement unit may all be sources of errors.

8.18.4 Presentation of results

Measurement results must be indicated in terms of E and/or H fields, respectively in V/m to A/m. If possible, the power density of the equivalent plane wave may be indicated, stating whether it was derived from the measurement of an electric or magnetic field.


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