EMFields ELF meter

< back page >

Power Frequency Meter PF4
User Manual

Table of Contents

Safety Instructions

Please read through these instructions carefully before operating the instrument. It contains important information regarding usage, safety and maintenance.

The instrument is not waterproof and should not come into direct contact with water, nor should it be used outdoors in the rain. If it is raining and you want to take measurements outside, please cover the instrument in a plastic bag that does not have holes in it. Clean the case using a damp cloth, and do not use detergents.

This instrument is not intended to be serviced by the user and it needs no special maintenance from the user. Unscrewing the case will void the guarantee.

This instrument is sensitive to heat and impact. Exposing the instrument to high temperatures or dropping the instrument may cause it to stop functioning properly. It may not display properly below freezing (0°C).

Guarantee

The EMFields ELF meter comes with a 2 year return to base Manufacturer's Guarantee. Please contact us for arrangement details. It is guaranteed to be free of manufacturing defects, but not against wear or damage from use.

Disposal

The Waste Electrical and Electronic Equipment (WEEE) Directive requires that old and unwanted electronic equipment must be disposed of using appropriate recycling and not placed with your normal domestic waste. When you no longer require your ELF meter, you can return it to us for recycling. Your postage will be refunded. Most UK local waste recycling centres also provide free collection points for electronic waste.

Disclaimer

While EMFields considers that the information and opinions given here are sound, you must rely upon your own skill and judgement when interpreting or making use of the information contained in this manual.

Contact

EMFIELDS, 2 Tower Road, Sutton, Ely, Cambs, CB6 2QA

Tel: 01353 778814

Email: info@emfields.org

http://www.emfields.org

Version 1, Issued: 20121123

Technical Specifications

Single-axis magnetic field meter using an 80 mm diameter sensor coil in the centre of the instrument.

Single direction electric field meter with sensor plate behind the top side of the case. The meter is designed be held by the user and is calibrated to measure the electric field that your body would experience at that point. It will significantly under-read if just placed on a surface.

Typical detector frequency response:

10 Hz – 2 000 Hz (cycles per second). UK mains is 50 Hz.

The -3 dB points are about 10 Hz & 2 kHz, 6dB per octave roll off.

Typical magnetic field response:

Magnetic Field: 0-19.99 microtesla (µT) (equals 0-199.9 mG)

Resolution 0.01 µT

Accuracy: ±2% ± 0.01 µT typical, ±5% ± 0.02 µT max.

Typical electric field response:

Electric Field: 0-1999 volts per metre (V/m)

Resolution 1 volt per metre

Accuracy: : ±5% overall, ±3 digits at 50/60 Hz

Power Draw: 7 mA at 9 volts

Power Source: 1x 9 V PP3 alkaline or rechargeable battery

Battery Life: Typically 75 hours on a new alkaline battery.
'Low battery' detection is indicated on the LCD screen.

Size: 190mm x 104mm x 33mm (LxWxD)

Weight: 258g, excluding battery (305 g with battery)

Introduction

The EMFields Extremely Low Frequency meter Model PF4, is a simple-to-use, professional quality instrument designed to enable you to take quick and accurate measurements of power-frequency electric and magnetic fields in your environment. It is the latest version of an established and well-tested design first made by us in the early 1990s.

It is an instrument that accurately measures the overall level of the electric and magnetic fields at frequencies created by power lines, substations and underground cables, as well as house wiring, and electrical appliances.

The meter can be switched to display either the electric field or the magnetic field. It also has a sounder which produces a pitch which rises as the field levels rise.

The meter does not measure DC fields (e.g. the earth's magnetic field).

Exposure to electromagnetic fields has been associated with adverse health effects, including cancers, depression, dementia & miscarriages. Our meter reads magnetic flux fields in microtesla (µT). The table below shoes some comparisons with other units (nanotesla and milligauss).

µT	Comments	nT	mG
0-0.15	Generally believed to be safe. We recommend below 0.10 µT in your sleeping areas (UK average is 0.04 µT). Pregnant women should avoid exposures over 0.15 µT. Fields close to some electrical appliances including electric cookers, washing machines and microwave ovens can exceed this level.	150	1.5
0.25	Disruption of the production of melatonin has been found for night exposures above 0.25 µT, and sometimes even lower. Melatonin is a very important hormone regulating the body's self-repair mechanisms and mood control. Less that 2% of UK homes are thought to have background EMFs above this level.	250	2.5
0.40	A doubling in incidence of childhood cancers has been repeatedly shown at levels above 0.4 µT, and by some research above 0.3 µT. In our opinion, 0.4 µT is too high for long term health safety in the home and it should be considered to be the maximum reasonable background level in the workplace.	400	4.0

Operation

1. Ensure that it has an appropriate battery fitted. The battery compartment is at the back of the ELF meter.
   (1x 9V PP3 /1604 Alkaline or Rechargeable battery)

2. Move the power switch into the "On" position. The LCD display should display a reading and the sounder should be ticking/buzzing.

3. If a pointer appears in the top left corner of the LCD next to the text "Low Battery" then the battery needs replacing or recharging.

4. Hold the meter away from your body using your thumb centrally placed on the bottom front of the meter, and at least two fingers behind the bottom back as can be seen in the picture below

Troubleshooting

Problem	Possible Solutions
The ELF meter isn't showing any reading.	• Check power switch is in the 'on' position • Check the battery is correctly inserted • The battery may be flat. Try changing it
"Low battery" is marked	• The battery is low and needs replacing
The instrument is giving varying readings when held in one location	• Some sources of EMFs are not constant and will naturally rise and fall even if the instrument stays in the same place • Moving the instrument can give erroneously high and variable readings • Changing the distance to a wall or source will significantly alter the electric field reading • Make sure you leave time for the reading to settle after moving the meter
The instrument is not picking up signals very well or does not seem sensitive enough	• For electric fields, make sure you are holding the instrument correctly • For magnetic fields, make sure you have followed the instructions about rotating the instrument about its axis • You may be in an environment with low EMFs. Typical background levels in UK homes are 0.04 µT for magnetic fields and 10-15 V/m for electric fields. Depending on the circumstances, some houses have even lower fields than this • In the case of powerline magnetic fields, the line may be temporarily closed down for repairs. It may still give off an electric field reading
The Electric Fields are high but the Magnetic Fields are low	• The two fields are not linked and one may be high whilst the other is low
I have screened/earthed my walls and now I am getting higher electric field readings	• Screening often creates large earthed areas which will attract electric fields towards them and prevent the fields from going beyond. Wherever possible, you want the screening to be in-between the source of fields and yourself. However, if you screen a wall upstairs, it can attract the electric field from the wiring in the ceiling of the floor below. This causes electric fields at floor level which travel up through your body and back towards the earthed wall, thus raising exposure

Exposure guidance levels

There are a number of general public maximum exposure standards for power-frequency EMFs. Most of them are based on the high ICNIRP guidance levels that are not set to prevent long-term adverse health effects (including cancer) but only to prevent acute (instant) effects like electric shock and direct neurological effects.

	Magnetic	Electric
Institute for bau-biology and oncology SBM 2008		
These set the strictest guidance:		
OK:	up to 0.02 µT	over 1 V/m
Slight concern:	0.02-0.10 µT	1-5 V/m
Concern:	0.10-0.50 µT	5-50 V/m
Extreme concern:	over 0.50 µT	over 50 V/m

Parliamentary Assembly, Council of Europe 2011 (Res.1815)
The assembly acknowledged the potential harmful effects of chronic long-term low-level EMF exposure far below ICNIRP guidance and called on European countries to reduce exposure to as low as reasonably achievable on the ALARA principle.

Powerwatch
Based on peer-reviewed science reports (you can freely download details from the Powerwatch library at www.powerwatch.org.uk)
The incidence of child leukaemia doubles by 0.3 to 0.4 µT and the breast cancer drug Tamoxifen stops working normally at 1 µT.

OK:	up to 0.1 µT	over 10 V/m
Slightly too high:	0.1-0.25 µT	10-30 V/m
Reduce if possible :	0.25-0.50 µT	30-50 V/m
Too high for the long-term:	over 0.50 µT	over 50 V/m

European Union countries (based on ICNIRP 1998)
General public guidance

OK:	up to 100 µT	up to 5000 V/m

Netherlands, Sweden, Italy (some regions), Denmark & Norway
These countries give a variety of advice but are mostly based on a maximum exposure in homes, nurseries and schools of less that 0.4 µT

UK Health Protection Agency 2011
Extraordinarily, the HPA has recently issued guidance levels set above the already high ICNIRP 1998 guidance. The HPA say that it acceptable for long-term exposure of 360 µT and 9000 V/m.

Magnetic fields come from our use of electricity. Every time electrical power is used, a current flows and that current produces a magnetic field. You get them from powerlines (overhead and underground) and electricity substations. You also get them from any electrical equipment you use. Items with transformers or motors generate the highest magnetic fields, especially close to the equipment / appliance. Magnetic fields are very difficult to shield and it is much better to reduce the amount that is being generated.

Electric fields are present all the time there is electricity on a wire or cable. All sorts of nearby things affect the electric field; people, chairs, items of furniture, so it is impossible to estimate the levels and you need to measure them at the places people spend much time (e.g. on beds, favourite chairs, etc).

To measure Magnetic Fields, set the readings switch to “Magnetic”. Holding the meter in the same place (where you wish to know the exposure level) , slowly rotate it on one axis until you find the maximum reading, and then do the same for the other axes. The highest steady reading most accurately reflects the actual field strength.

To measure Electric Fields, set the readings switch to “Electric”. Ensure you are holding the meter as directed as this can significantly affect the readings. The electric field sensor is inside the top edge of the instrument. Move the meter to the desired area and hold it still for several seconds so it can settle.

Electric field readings should be taken at least 25 cm from walls or other large surfaces. The meter is calibrated to read electric fields accurately when it is being held. The electric field readings will be inaccurate when the meter is put down on a surface and not held in your hand.

More about magnetic fields

Checking your property

We recommend that you check the magnetic fields with:

1) everything switched off (preferably at the consumer unit / fuse box). You can now determine the background level from external sources. Unless this is due to a 'stray' current, it is unlikely that you will be able to reduce this. Measure it at a peak time (usually 5.00—7.00 pm in residential areas). Usually, 'stray' current comes into the house on your water or gas pipes and returns out through the electricity earth. Check for this by measuring the field near to these pipes where they enter the house (line up the side of the meter alongside the pipe). The reading should not increase. If it does remedial work is needed. Read our House Wiring and EMF booklet.

If the background magnetic fields are higher than normal (say above 0.05 µT) throughout the property when the power is off, and the field outside increases towards the road then, unless you have a high-voltage powerline nearby, there is likely to be a fault in the local underground electricity distribution network supplying electricity to houses from the local substation.

2) Turn on the power. Plug in and switch on a significant load (e.g. a kettle or fan heater) in the lounge. The reading in the centre of the room should not increase by more than 0.02 microtesla.

3) repeat 2) with the appliance plugged in to a socket in each room in turn. Measure the magnetic field level, especially on beds, holding the meter just above the pillow.

4) You may have lights with two-way switching such as those found at the top or bottom of stairs, in the lounge or for the main bedroom light. Turn on the light, first with one switch and then with the other. The magnetic field levels in the room should not increase.

If during the test in 2) to 4) any of the above show significantly increased magnetic fields, your wiring is almost certainly faulty.

High magnetic fields can be found close to electric appliances, especially those having a motor and/or heater, e.g. a hairdryer. The electromagnetic field levels from electric appliances close to a pillow should be measured very carefully and the appliance moved if necessary. Electric blankets (whether under- or over-blankets) should not be left switched on when you are in bed. It is also worthwhile measuring the fields from storage radiators and meter cupboards – note that magnetic fields go through walls.

More about electric fields

Whilst identifying sources of high electric fields can be difficult, there are some general rules of thumb you can follow to narrow down the possibilities. Inside a building electric fields will be due to the building wiring, as electric fields generated outside are normally stopped by the building's wall materials.

Electric field readings near radiators (particularly upstairs) may show as being unusually high. This is usually not a problem with your plumbing/radiators. It is instead because your body is acting as a conductor between the 230v wiring under the floor (for the downstairs lights) and the earthed radiator. To measure the fields as they are naturally, stand on something insulated (such as a plastic sheet, box or stool).

Electric field measurements when on the bed area should be obtained holding the meter while lying on the bed.

The electric field level often rises towards the ceiling, mainly due to the fields from light fittings and lighting circuit wiring. Some common wiring styles used for lighting circuits produce high fields near the ceiling and light switches.

Electric fields can be reduced by re-wiring using screened cable.

If this is not practicable, a "demand switch" can be fitted. This disconnects the circuit wiring from the mains electricity when nothing is switched on. It can particularly help to reduce electric fields during the night. It becomes ineffective as soon as something is switched on.

In most domestic sitting and sleeping areas it is usually possible to keep electric fields below 15 volts per metre (V/m), ideally below 5 V/m, and in houses with wiring in good condition it is unusual to find levels above 50 V/m more than 50 cm away from electrical switches, sockets, lights and appliances.

Our article 'House Wiring and EMFs', freely downloadable from our website www.emfields.org contains much practical information.