

Measuring exposure, screening and protection

You may want to know whether you are exposed to RF sources from outside (or inside, including by neighbours). The only reliable way to know is by measuring the fields using an appropriate piece of equipment.

The instrument we recommend for ease of use, accuracy and helpfulness is the [Acoustimeter](#), available from EMFields to hire or to buy. It has been designed by Alasdair Philips of Powerwatch. If you decide to buy an Acoustimeter, EMFields also supplies a [case](#) to protect it when you use it away from the house.

The Acoustimeter registers peak and average field levels both with a series of LEDs and a digital display. The Acoustimeter detects the higher band WiFi, which is above the level that many other RF meters are sensitive to, as well as all other RF signals.



The Acoustimeter

How does microwave radiation get in from outside?

Microwave radiation from external sources travels through most common building materials, most easily through ordinary glass with very little reduction, and fairly easily through most building materials, brick, wood, concrete, etc.

When microwave radiation enters a home, a lot of it is absorbed by whatever is there, especially people. The body does not store up the radiation, it is dissipated as heat, at such low levels that we are unaware of any temperature change. But there is evidence that this exposure is sufficient to sensitise many people, resulting in their suffering ill-health or a more generalised, debilitating, electrical hypersensitivity (ES).

If a mobile phone is placed in a microwave oven, designed to stop high levels of radiation leaking out, and the door is then shut, 2 out of 3 mobiles will still ring. For a microwave signal strong enough for a mobile phone to work to get in, it becomes clear how pervasive and intrusive microwave radiation is.

Microwave frequency is such that the radiation can get through small holes, especially slots, and great care needs to be taken with any form of shielding that no gaps are left for the radiation to

get through. Microwaves are like a cross between light, which travels in straight lines, and water which flows around obstacles. If you try to dam water, it will still manage to get through small holes and will then flood the area it gets into. If microwaves find a hole, they will get through and expand into the area behind the shielding in such a way that the shielding is much less effective. “Total RF shielding” is very difficult and expensive and is unnecessary for most people, however for any shielding to be worthwhile, care will need to be taken with its installation.

If you live in the beams from a nearby mast, shielding only the windows will usually reduce the microwave levels in a room by quite a lot, but you will probably also need to shield your walls and maybe even the ceilings and floors. If the radiation is from a neighbour’s DECT phone, WiFi, burglar alarm or baby monitor, you will certainly need to think about shielding the walls.

A mobile phone is not a suitable means of detecting the strength of microwave radiation entering a room. A phone handset can work at tiny signal levels (0.000005 V/m), and can still display a number of signal strength bars even after a significant amount of remedial reduction work has been done. If there is a 1 volt per metre RF level in the room you are concerned to shield, then you would need to screen by 99.99% before the phone starts to lose bars, and 99.9995% to reduce the incoming signal strength sufficiently to stop the phone from ringing. In Salzburg (where they currently have the lowest public microwave exposure guidelines in the world) the maximum permitted level is 0.02 V/m inside bedrooms. At this level a mobile phone will show ‘full signal strength’. We believe that 0.1 V/m is low enough not to cause adverse health effects in most people. If this level does cause symptoms, most of us will have problems in the medium or long-term, as most of us are subject to this sort of level of microwave exposure outside our houses, and indeed levels considerably higher than this are common in towns and cities. Those who suffer from Electrical Hypersensitivity (EHS) can react to levels of 0.01 V/m and below.

After measuring the fields, you may find that the field levels are undetectable and there is nothing you need to do. If you are finding microwave radiation penetrating your home, or place of work, there are several ways you can reduce the levels you are exposed to. We consider the advantages and disadvantages of many of these below.

All bed canopies and clothing (including headnets) are available zero-rated for VAT for those who sign the form saying they are electrically sensitive. No doctor's signature is necessary. The earthed lamps can also have the VAT reduced as there is exemption for changes made to the lamp to make it acceptable to people with ES, though this exemption does not cover the lamp itself, before modification.

Windows

We start with the windows as these provide least protection from microwaves entering your home from an external source.

The glass

Normal single or double-glazing glass offers little resistance to the passage of microwaves into your rooms – almost all pass straight through. Aluminium window frames will prevent microwaves coming through the frames. Other window frames without any metal in the frame will also need to be painted with special screening paint, or covered with screening material, window film or aluminium foil tape, otherwise the ‘long slots’ around the glass panes will allow microwaves to enter the room.

Window film

EMFields offers three different sorts of film (listed from best to least in order of effectiveness)-

- **Hilite** – This is the most effective film for shielding, blocking over 99.99% of the power, and between 96% and 99% (depending on frequency) of the signal strength. It is extremely transparent, letting over 90% of visible light through.
- **Sterling 20** - Perfect for use in bedrooms. It offers a similar power reduction, but slightly less effective shielding on the signal strength as the Hilite. It is a dark film, letting 20% of visible light through.
- **Sterling 50** - It screens out over 99% of the power and over 90% of the signal strength, varying by frequency. It lets in more light than the Sterling 20.

For further information about the effectiveness of the [window films](#).

Like book-covering film, all window films need *extremely* careful fixing. You may need specialist help to get a wrinkle-free finish. EMFields has a DVD with full instructions for do-it-yourself. Alternatively, you can have it done professionally. The company EMFields works with has specialist installers across the UK and some in other countries, too.

Opening a window for ventilation (essential for good health) will also allow entry to microwaves, even when the windows are covered with film.

Curtains

Curtains made of the special screening material offer protection even when the windows are open. EMFields has 3 types of material available for curtaining, 1 loose-woven net material (Chromax), 1 translucent material which protects and lets less light through, but offers more privacy and protection against high band WiFi (Naturell), and one opaque material for use as lining material or that can be made into window blinds. For their effectiveness see <http://emfields.org/shielding/screeninggraphs.asp>. Material used as curtaining does not need earthing.

If your windows are wider than the material and you need more than one length to cover the window, there should be at least a 3cm overlap, where the curtains meet so that microwaves cannot get between the two curtains. You may want to ensure the microwaves cannot get around the material by fixing the sides to the wall side of the window frame and the bottom of the material to the underside of the windowsill.

Hot sunlight in combination with high ultra violet levels (which are increasing because of the hole in the ozone layer), degrades most fabric materials with time.

Naturell



Naturell is a lightweight, fine woven white cotton material. It is 2.5 metres wide, and hangs beautifully as a curtain. It is translucent and allows plenty of light through, whilst restricting visibility from outside. It is our most effective material, and ideal for bed canopies, clothing, blinds or curtain lining.

It is washable at 30°C, either by machine (delicate cycle) or carefully by hand. Use a cool iron, if necessary. It can be dry cleaned. You can refresh the material by hanging it out to blow on a day that is fine.

Electrocloth

The electrocloth material sold by EMFields is made of cotton interwoven with stainless steel. It is 1.44 metres wide. It shields about 98% signal strength from mobile phone mast signals (all frequencies) and still about 90% of the high-band WiFi frequencies. It is the heaviest of the materials and is stone coloured. It can be sewn easily and is opaque to light. It can be used as **curtain lining** for your existing curtains, though because it is quite heavy, you will need to check that your current curtain track and curtain fixings are suitable.

The electrocloth material could be made into a roller blind, or used to line one.

The electrocloth material will offer a significant degree of protection when the curtains are drawn or the blind is down. There will be gaps around the material, with either use, which will still allow some level of microwave radiation to enter the room.

Chromax material



The material is white polyester, the fibres of which are interwoven with 5-6% lacquered silver plated copper fibres. It is very lightweight. It is 2.5 metres wide, and lets through about 90 - 95% of light into the room. It shields about 95% signal strength from the mobile phone frequencies, 90-95% WiFi, and under 80% of the high-band WiFi frequencies.

You may want to ensure the microwaves cannot get round the material by fixing the sides to the wall side of the window frame and the bottom of the material to the underside of the windowsill.

It is washable at 30°C, either by machine (on a delicate cycle) or carefully by hand. Use a cool iron, if necessary. It can be dry cleaned. You can refresh the material by hanging it out to blow on a day that is fine.

Bed canopies

All bed canopies are available zero-rated for VAT for those who sign the form saying they are electrically sensitive. No doctor's signature is necessary.

The canopies do not reduce your exposure to the earth's geomagnetic field, which is beneficial.

Naturell and Chromax



These can be made to order in different sizes – single, double (which also fits King Size) and Super King Size, and two shapes; the four poster shape pictured and a dome-shaped canopy. The four poster canopy pictured is made out of Chromax material.

The material in the dome-shaped canopy needs to be lifted to get into bed; with the four-poster shape canopy, the material can be moved aside to allow access.

The material should touch the floor all around, without gaps. You may need to consider painting (see below for paint details) the floor under and around the bed to prevent microwaves from below entering the canopy.

BlocBag sleeping bag

Many people asked us about bed screening when they go away to visit friends and relations, on holiday or business trips. To help in these situations, the BlocBag has been developed.



At last! A good quality of sleep when away from home. The BlocBag also has a transparent head cover built in that can be drawn over the head for complete protection.

Bedding

The electrocloth material could be used to make bedsheets or even a sleeping bag, for people who do not want to sleep under a bed canopy, It can be used as a sheet under the mattress to prevent microwaves reflecting off the floor, or coming up from a downstairs source, especially in flats where a downstairs neighbour may have a cordless phone or a WiFi system.

Walls

There may be significant amounts of RF radiation coming in through the walls of your home, and possibly even the ceiling, through the loft space, or upstairs neighbour, or through the floor, from downstairs, or a neighbour living below.

Paint

EMFields has two types of special microwave screening paint in stock. The **Y-shield paint** has been tested by the Microwave Laboratory of the University of the German Federal Armed Forces in Munich. One layer has a shielding effectiveness of up to 99.99%, an attenuation of 40dB. Multiple layers can even improve on this.

It contains carbon, is water-based, free of toxic solvents, plasticisers, film-forming agents, and it allows the walls to breathe.

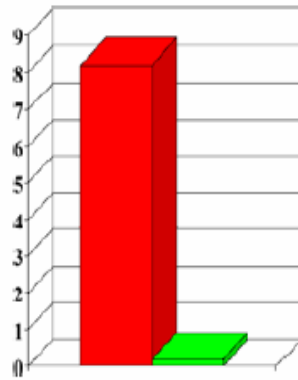
You can use the paint on inside walls, or on the outside of your house. Below, you can see pictures taken after application of the shielding paint, and subsequent top-coat finish.



The paint needs to be stirred VERY thoroughly in order for the conductive carbon filaments to be distributed evenly throughout the paint. If this is not done sufficiently well, the coverage and screening will be patchy.

You need to apply the paint with a good quality paint roller with 10-13 mm long fibres for best results. It is important to make the layer even, and not to over-roll as either of these will reduce its screening potential. You can then over-paint it with a colour of your choice, using a good, vinyl paint, without reducing the microwave protection. The paint needs to be left for *at least* 24 hours. This is not only to allow the paint to dry, but to ensure that no chemical bonding will take place with a subsequent layer of paint, reducing the shielding effectiveness. If you wish to hang pictures on the painted wall, it will not affect the screening properties of the painted surface. Metal nails will provide a conductive link, and small holes will not allow the microwave radiation to enter the room, unlike slots.

The coverage is about 7 - 7½ square metres per litre for the paint used internally and between 3 to 8 square meters per litre for the paint used externally, depending on how rough the surface of the house is. Rough plaster will give a coverage of about 3 square metres.



A graphical representation of RF exposure before and after screening with the carbon paint.

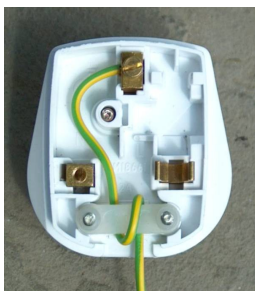
Blocpaint is produced in the UK, has similar screening properties and coverage and can be applied with a brush.

A neighbour's DECT phone may result in significant levels of RF radiation in your home, and you may need to paint the party wall to reduce incoming emissions. It may be necessary to cover the whole of the wall to prevent the microwaves coming round the ends of the painted surface.

If the source of microwaves is above or beneath you, such as a DECT telephone or wireless networked computer system in a neighbouring flat, the best thing to do is paint the ceiling or the floor underneath your carpet or other floor covering. Most modern houses are wired in ways that give rise to high electric fields and you may want to earth the paint you use. If you have painted the floor and the wall(s), we recommend earthing them both. If you have only done the walls, you may choose not to earth them.

Earthing leads are available from EMFields, complete with fixing instructions. The earthing lead needs to be carefully fixed in place so that it will not be pulled from the wall. It can then be painted or papered over.

The other end of the earthing lead can be connected to a metal water pipe (a hot water radiator system is ideal). Any paint or varnish needs to be removed so that the earthing wire makes good contact with the metal. Use a proper pipe earthing-bond-clamp (similar to a 'jubilee clip') available from any good electrical supplier. Radiators will be earth bonded, where only copper piping is used for the heating system. However, many plumbers are now using plastic pipes to get round some of the more difficult corners in a plumbing system. These will mean that the radiators will not be bonded to the house earth. It is not always easy to spot lengths of plastic pipe as they may have been painted to resemble their metal counterparts.



If your system is not earth bonded, or you are unsure, you may want to earth the paint through the house wiring system, by connecting the 'Earthing lead' attached to the painted surface directly to the Earth pin of a 13Amp plug (see diagram). The plug should be inserted into a socket, where it will make a continuous contact with the house earth. The wall socket does not need to be switched on for it to do so. Sometimes earthing the paint can make people who are very sensitive feel worse. In which case it is easy to remove the earth wire.



If you paint the *whole* of an outside wall, we recommend a more robust fixing in the form of a special earthing kit provided by the paint manufacturer. This can be connected to an earth stake, made of a suitable metal such as copper. If you are only painting a section of outside wall, there is no need to earth the special paint. Earthing the wall is not required by UK building regulations, as it is in some other EU countries. The earthing kit is best applied onto the wet paint coat. It works perfectly, except in cases where you have no good earth at all (such as where there is a 'net current' from substations).

Skirting boards and curtain battens

Ideally, for maximum reduction, skirting boards should be taken off and the paint should extend to floor level before the skirting board is replaced. If this is not possible then you can paint the skirting board. Oil-based paint would need to be well prepared or removed, first.

Microwaves can easily go through slots in shielding that are longer than about 10 cm (4 inches). To ensure they cannot penetrate the wall and then the curtain batten, you need to either remove the batten and paint behind it or you can paint it or cover it with the self-adhesive aluminium tape available from EMFields.

Ceilings

Microwave radiation from an external source, or upstairs flat, may be coming through the roof or ceiling. If you are still getting high microwave fields after having shielded the walls and windows, you may need to paint the ceiling. Painting is by far the easiest way of applying a screening layer. We have found houses where the signals are picked up on the ceiling / loft wiring and then rebroadcast from the lights hanging from the ceiling. Typical 7.5, 15 and 30 cm drops of cable from the ceiling to the light make quite efficient transmitting antennas at mobile phone frequencies. EMFields can supply clip-on ferrites to help reduce this problem.

Doors

Doors can let microwave radiation through and may need to be painted. If the door is a critical entry point for the microwave radiation you want to shield against, you will also need to ensure you deal with the door frame in such a way that there is a snug fit when the door is closed.

Insulation

Foil-backed plasterboard and foil-backed insulation board can reduce incoming microwave radiation significantly. It is important to ensure that the foil at the back of the board is not damaged at the edges, as slots are ideal entry points for microwave radiation. It would be best to use aluminium foil tape to join two sections. This will provide a continuous screen that can then be earthed, to avoid the problem of re-radiating electric fields mentioned above.

Some insulation materials that look like metallised plastic do screen against microwaves, some do not! The only way to find out for certain is to test with an instrument such as the Acoustimeter, before screening large areas. Those that do may be ideal for use in a loft to prevent microwave entry through the roof.

Some products may also be appropriate to use underneath a mattress. Two products that we believe may be suitable are available from www.screwfix.com products 76477 & 50913 – Thermawrap & Airtec.

Phones

Some people who are sensitive to EMFs find they react to ordinary wired telephones. One of the reasons this may be, is that there can be broadband radiofrequency "noise" coming through the wire from the telephone socket. This noise is almost universal in the UK now, even if you personally do not have a broadband internet connection. The ADSL double filter reduces the electromagnetic noise dramatically.

Digital cordless (DECT) phones have been a problem as they use mobile phone technology and most radiate RF from their base unit 24 hours a day. EMFields has found some [low EMF DECT phones](#) to sell, which do not emit at all when not in use, and the levels are very low indeed when the ECO DECT PLUS system is activated, even with several handsets.

Mobile phone protection is also available from EMFields, see section 5.

Mains filters

The mains filter unit available from EMFields contains a powerful mains conditioning filter which will reduce or eliminate interference on your house mains electricity supply coming from computers, TVs, videos, modern switched-mode mains adapters and chargers, etc. It stops RF signals being sent into your house wiring, greatly reduces interference from external sources, often improves picture and sound quality with AV equipment, and has 6 sockets for UK plugs.

Lighting

Many people do not like the relatively new compact fluorescent (CFL) bulbs that have replaced the older incandescent ones. Many of them give off significant levels of RF as well as containing toxic mercury. LED bulbs are an alternative which do not emit UV light either. They have greatly improved since their first introduction, though many also give off high levels of RF. EMFields has researched those [LED bulbs](#) that give off low, or very low levels of EMFs.

People who are ES may benefit from the [earthed lamps](#), which not only protect from RF but also powerfrequency electric fields, yet still offer the range of lighting options for enjoying all activities.

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