Radio Society of Great Britain
Advancing amateur radio since 1913

EMC Advice Leaflet EMC 4:
Interference to Amateur Radio Reception

The purpose of this leaflet

The RSGB EMC Committee receives many enquiries from members about potential interference to the reception of amateur radio signals. This information sheet gives advice to members about identifying and locating the sources of Radio Frequency Interference (RFI) that affect the reception of signals in the amateur radio bands.

Introduction

While man-made interference has existed for as long as there has been radio reception, in recent times the proliferation of electronic devices and gadgets is making the problem much more widespread. Unless you live in an isolated location, away from any neighbouring properties, and away from overhead telephone wires, electricity distribution cables, electric fences, etc then it is very likely that you will be able to detect a range of interfering sources on almost all amateur frequencies from MF to UHF and even beyond. And even if you are in an isolated location, you will almost certainly be able to hear radio interference from devices within your own house.

Almost every electrical or electronic device has the potential to cause interference and therefore the growing proliferation of, for example, non-linear switched mode power supplies, LED lights, VDSL broadband, microwave ovens, televisions, induction hobs, electric motors in devices from food mixers to lawn mowers, wireless charging devices etc. means that for most amateurs the radio spectrum noise floor, in particular in the lower HF bands, is now completely dominated by man-made noise rather than background atmospheric noise.

Furthermore, when members of the EMC committee are tasked to investigate interference affecting the reception of amateur radio signals, increasingly we find that at any individual site there is not a single source of interference, but that the interference is the sum of a number of different sources, emanating from a range of devices.

Radio interference can take the form of blank carriers, signals with unidentifiable modulation, carriers drifting or rapidly sweeping across the band or just high background noise levels. It may block out specific frequencies or whole bands. It may come and go at different times of the day, or be persistent throughout the day.

Resolving interference, particularly in urban environments, may at first seem a virtually impossible task. Nevertheless, by taking a logical approach, in most situations it should be possible to identify the source (or sources) of the interference. Then hopefully, it can be eliminated, or at least, reduced to tolerable levels, either by removal of the interfering device, or by suitable filtering or screening.

Of course, where the interference source is outside the control of the radio amateur, then identifying the source doesn’t necessarily mean that the interference can be eliminated. Nevertheless, being armed with knowledge of the source will usually assist in reducing its adverse effects on the operation of the amateur’s station.

Finding the interference

Finding a source of interference requires a methodical approach. The best approach is to start with the broad view and gradually focus in on specific potential sources. Sometimes it is easier to begin by identifying what isn't causing the interference rather than what is causing it. Once the obvious things have been eliminated, then the best strategy is to work through nearby devices that could be the cause, searching the possible locations from where the interference can originate, and looking at the characteristics of the interference to help identify it.

Background noise levels

Even in a radio quiet location, atmospheric and thermal noise will be present in every receiver. At 10 to 15MHz, the S meter should show a background noise level of around S-1 or S-2 (when measured in a 500Hz bandwidth). This noise level will gradually increase as the frequency decreases so that at 2MHz it is likely to be around the S-4 level. Anything significantly above these levels may indicate the presence of undue interference and is worth investigating.

Is the interference being generated locally?

One of the most likely places for the source of the interference is in your own house. Could it be something in the shack, or in the home? Progressively turning off all electrical devices may pinpoint the source. Try everything - fridges, televisions, radios, mobile phone chargers, electric toothbrushes, central heating controllers, LED lighting, computers, routers etc. Do not assume that because a device (such as a TV) is on standby that it cannot cause interference. Disconnect it from the mains. Do the same with such things as USB chargers. Plug in and out the USB device being charged. Be aware that sometimes the interference can be even greater with devices on standby than when they are fully on. Because switched mode power supplies (SMPS) are typically smaller and more efficient than equivalent linear power supplies, most modern electronic devices use SMPSs (even some that are battery operated) and be aware that some may be permanently wired in and cannot be unplugged.

If possible, operate your receiver on batteries and turn off ALL the mains power to your house at the consumer unit. If the interference reduces or disappears, then turn devices on one at a time until the offending device is found. Once an offending device is found, confirm that it really is the source of the interference by turning it on and off more than once to verify that the interference is present when it is on, and that it disappears when it is off. Also remember that after you turn an item on, that it may take some time to warm up, or to come out of standby, before the interference reoccurs.

But remember that even turning off the power may not silence everything, since some items may have battery backup (e.g. an alarm system). Further be aware that alarm systems may have active electronics in the external bell box that can cause interference. Even 'dummy' bell boxes that have battery powered flashing LED's can cause interference.

On the HF bands, interference can enter your home via the mains supply, whether underground or overhead, and can be radiated by the mains wiring throughout your house. In such cases, switching off at the fuse box will probably reduce it, although this depends on the exact layout of the mains wiring. Pickup of mains-borne interference on the HF bands can often be reduced by moving your antenna further from all mains wiring (if possible), or by using a balanced antenna such as a dipole instead of an end-fed antenna.

With the mains power switched off, the telephone line will nevertheless still be active, even if your cordless phone and internet router are off. For the telephone, try disconnecting all the internal house telephone wiring. For a BT Openreach installation, this is typically done by removing the front cover of the master socket. If this changes the level of the interference it may well identify this as a likely source.

If possible, use a portable radio, portable transceiver, or RTL dongle, perhaps with a sniffer loop, to try to locate the source of interference by moving the receiver around and noting the change in the noise level received. If possible, either turn off the AGC on the receiver or alternately watch the S meter since with the AGC on this will tend to counteract any change in signal level. If you are using a receiver with a ferrite rod antenna (e.g. an AM broadcast receiver) then remember that this has useful directional properties (typically a strong null when the ferrite rod is in line with the direction of the source) and this can be used to help direction-find an offending interference source.

Also be aware that most interfering devices emit near-field emissions, so you need to find a frequency where the interference is present near the device and then see how fast it decays as you move away. Near-field effects often decay away within 2-4 metres.

If the source is in your property, then it may be possible to eliminate the interference for example by filtering the mains supply (either to the interfering source or to your transceiver), or by using common mode chokes on the antenna feeder.

Is the interference real?

If the interference does not appear to be locally sourced, then the next step is to determine whether the interference is really coming from the outside world, or whether it is something generated by your receiver itself. All receivers are susceptible to being overloaded by very strong signals which can then generate spurious signals inside the receiver. At first sight, these signals can look and sound much the same as external interference.

So, if possible, try a second receiver. Ideally you should use a different model of receiver so that the characteristics (e.g. filter performance, IF frequencies etc.) are different from your main receiver. If the second receiver does not show the same interference on the same frequency then the problem is probably not external interference at all, but is more likely to be an issue within the main receiver itself. For example it may be intermodulation caused by the receiver being overloaded by strong outside signals, perhaps from a local broadcast transmitter or a nearby mobile cellular site. In this case, the solution is to install either a band-pass filter for the band that you want to listen to, or a band-stop filter designed to filter out the interfering signal. Either should be fitted at the front-end of your receiver, and most modern transceivers have the facility to allow such a filter to be added.

If the interference is also present in the second receiver, then one further check is to operate the receiver with a different aerial. If a second antenna of a different type is available (e.g. vertical vs horizontal) or in a different part of the garden, try that. Otherwise in the case of HF, try a random length of wire dangling out of a nearby window, or in the case of VHF or above, use a simple hand-held wire dipole. If this eliminates the interference, then this could indicate a faulty main aerial. For example, corroded joints can act as a crude diode, and the resulting non-linearity can cause received signals to be demodulated or to appear on strange frequencies (the so called “rusty bolt effect”). A second antenna could also give clues about proximity or polarisation of the interference source.

If a second receiver is not available, then an alternative approach is to use the switchable attenuator on the main receiver. If, for example, a 10dB attenuator is switched in, then if the interference is real, and is not something generated within the receiver, then both the received signal and the interference should fall by 10dB. So tune in a stable signal (e.g. a beacon or a broadcast transmission) on a nearby frequency and then note the change in the S meter reading when the attenuator is switched in and out. Now tune to the interfering signal and do the same test. If the interference level changes by either significantly more or significantly less as the attenuator is switched in and out then this would indicate that the apparent interference is a function of the receiver and is not necessarily real interference coming from the outside world.

Is the interference coming from a neighbouring property?
If the interference is not coming from something in your own house, could it be coming from a neighbour's house, or something nearby? Here a bit of detective work is useful.

Walking or driving around with a mobile receiver and taking signal strength readings from different locations may help locate a source of interference. A hand-held portable receiver with a whip antenna may be useful, walking around, gradually reducing the length of the whip as the interference source is approached. If the interference can be heard on the broadcast bands then a Medium Wave AM radio could be used. But when trying to direction-find a source, be aware that overhead distribution wires and other large metallic objects can affect the apparent direction that the interference is coming from.

As you move towards or away from the source of the interference, the received level will change. For a radiating source, the signal level will decrease by the square of the distance, i.e. double the distance from the source and the field strength will reduce to 1/4, while the near field strength will reduce to 1/8th. This can sometimes be used to estimate how far away a source of interference is. However be aware that this can be confused by cables and other metalwork in the vicinity, in particular if this happens to resonate at the measured frequency.

Alternately, where a beam antenna is available, this can be used to see if the direction of the interference can be pinpointed. Using further beam headings from other locations, and plotting these directions on a map, it may be possible to accurately triangulate the location of the interference.

Is the interference coming from a much more distant source?
If you suspect that the interference your equipment is suffering is far from your location, then if possible, enlist the help of other amateurs. Can they hear the interference? Is the interfering signal stronger or weaker at their location? Again, recording beam headings from different receiving locations can help to triangulate the source.

As an alternative (or supplement to) reports from other amateurs, when identifying more distant interference sources, it can also be worthwhile using one or more of the on-line web SDR receivers e.g. http://www.websdr.org These are located all around the world and may help locate the source of long-distance interference by comparing the strength of signals on SDRs at different sites. Some also have directional antennas which can further help to narrow down the likely location of the source.

Assessing the characteristics of the interference
Interference can take many forms so pinning down its characteristics can help identify the source.

Is the interference narrowband or broadband? Is the interference concentrated on just one specific frequency, does it spread across a narrow band of frequencies, does it occur across the whole band, or can it be received across more than one band?

Some interference sources may be on a single frequency (such as a harmonic from a broadcast transmitter), while some may be spread across a whole frequency band, perhaps with regular peaks occurring across the spectrum. For example, a switched mode power supply (SMPS), if not properly suppressed, may generate harmonics at its switching frequency, and this will generate spikes of noise typically every 15 or 20kHz spread across a very wide band of frequencies.

Some interference may just look like continuous random noise covering many MHz. For example, interference from broadband VDSL services will take this form.

Further, does the interference drift in frequency or is it fixed in one spot? Drifting interference may suggest a free running oscillator such as in a SMPS (although be aware that some SMPSs use resonators to relatively accurately control their frequency). Often a free running device will change frequency with temperature or load, so if a device is suspected, cooling it down with a quick burst of spray from a can of freezer, or switching the device between 'on', 'off' and 'stand-by' may help identify the culprit with a change of interference level or frequency.

For broadband interference it is useful to identify whether the interfering signals can only be heard in the amateur band or whether it affects other bands. For example, can it be heard in the broadcast bands e.g. on medium or long wave, or the VHF FM or DAB bands? Experience suggests that the authorities are more likely to act against interfering signals that affect broadcast bands than those that predominantly affect amateur bands.

When trying to identify the interference characteristics with a receiver it is best to use AM mode with the bandwidth set as wide as possible, rather than listening in a restricted bandwidth as is typically used for SSB. This should allow the user to hear other modulation that may be present such as 50Hz or 100Hz harmonics of mains borne interference and this may give further clues as to the potential source. Do not use the FM mode as this will not accurately reveal either the strength of the interfering signal or any amplitude modulation of the signal.

It is also worthwhile trying to evaluate the characteristics of the interference. Listen to the sound of the interference and examine the look of it on a waterfall display. This can then be compared with the characteristics of a very wide range of different types of signals and interference on various frequency bands on www.sigidwiki.com

When did the interference start?

Was the start of the interference concurrent with some other event? For example, did it start when a neighbour installed solar panels on their roof, or when the nearby street lights were changed to LED bulbs, or when a wind farm was constructed in the vicinity? Does it only occur when the sun shines, or the wind blows?

When does the interference occur?

One thing to determine is whether the interference occurs continuously, or whether it is intermittent.

If it is intermittent, is it concurrent with anything identifiable e.g. does it occur at the same time every day, or does it occur whenever lights are turned on, or only, say, in television viewing hours? Keeping a log over one to two weeks of when the interference occurs may provide valuable clues as to its source. Log the time, the bands affected, the characteristics of the interference, and anything else that you feel could be relevant in identifying the possible source.

Many sources of interference have been easily identified this way e.g. when new LED street lights are illuminated, when local wind turbines are turning in the wind, when clouds pass over a solar PV installation or even when your next-door neighbour cuts his lawn or is using power tools in the garage.

A further aspect to be aware of is that interference may begin gradually e.g. as devices age, faulty components, particularly capacitors and batteries, can create new sources of interference.

Further, don't be fooled into thinking that interference will only occur when devices are active. Some modern power supplies have been known to create more interference when the load from them has been disconnected than they do when they are under full load.

Consider also battery powered devices such as a laptop, tablet or handheld device. These often only have an impact when close to an antenna or to shack cabling, so moving them can cure the problem.

Once the characteristics of the interference have been determined, these can be compared with known interference types. If necessary, record the interference or take a screenshot of the waterfall display and contact the RSGB EMC Committee for help. If you do take a spectrum or waterfall display screenshot, make sure that is shows the frequency and time scale values, and that the image is clear enough for someone looking at it to be able to read.

What are the common sources of interference?
There are many different devices in use today that can cause interference. Below are details about some of the more common sources.

Switched Mode Power Supplies (SMPS): Most low voltage mains powered devices today use switched mode power supplies, rather than linear (i.e. mains transformer) power supplies. This includes phone chargers, televisions, electric toothbrushes, LED lights and many other devices.

A switched mode power supply (SMPS) works by switching the power on and off many times each second in order to produce a regulated output. However, if not properly suppressed, it may generate harmonics at its switching frequency, typically 15 or 20kHz and this can occur across a very wide band of frequencies. The noise may take the form of a buzz which often drifts around in frequency, typically as the temperature or load on the power supply changes. If the Switched Mode Power supply is in a TV, then the interference characteristics may change with the picture content.

For plug in power supplies, the level of interference experienced often changes if the power supply is disconnected from the device it is powering. But beware, it is not necessarily the case that it will only produce interference when the powered device is on, some SMPSs produce more interference when they are in the idle state.

LED lights: LED lights come in many different styles and are increasingly used today because of their much increased efficiency and long life when compared to conventional filament lamps. LED lights are typically powered by some form of switched mode power supply, which may be integrated into the bulb, or located close to the actual bulbs (perhaps hidden in the ceiling above the lights). Any interference will typically take a similar form to other SMPS powered devices.

VDSL: VDSL (broadband internet access) is a growing, and often undetected, source of interference. The emissions from VDSL are continuous, whether or not the internet is being used. The characteristics of the interference are that it produces wideband noise which can easily be mistaken for conventional background noise (e.g. thermal noise, atmospheric noise etc). In effect, with VDSL interference, the receiver sounds insensitive and the background S meter reading is higher than would be expected.

Interference is more likely to occur where the telephone service is being delivered over aerial (above ground) cables into your house or adjacent houses since the telephone drop wire can act as an efficient hf antenna.

In the UK, VDSL currently uses frequencies up to 17.66MHz with alternating frequency bands for upstream and downstream data transmission. In between the upstream and downstream bands are small guard bands which contain no interfering signal. So, the most reliable way to identify VDSL interference is to look for these narrow guard bands where the interference will be considerably less.

For VDSL, these guard bands occur at 0.138MHz, 3.75MHz, 5.2MHz, 8.5 MHz and 12MHz. Each guard band is around 50KHz wide. Tuning around these frequencies and listening while watching the S meter will show a noise step if there is VDSL interference. The signal first drops just below the guard band and then rises again above the guard band frequency. Looking for the 8.5MHz guard band is probably the best starting point.

Note that VDSL interference may come not just from your own telephone service, but also from the VDSL service from your neighbours, so the interference from several sources may be superimposed, which tends to make the guard band transitions less distinct.

If VDSL signals are leaking out of the telephone cable and causing interference, then it is possible that when you are transmitting, the transmitted signals may leak into the telephone cable. This may cause the VDSL system to enter a “re-training” mode where it generates training carriers at approximately 4kHz intervals across the whole VDSL frequency band. These may persist for a few minutes after you stop transmitting.

With VDSL interference it is also worth observing that the router itself, its power supply unit, as well as the Ethernet ports and cables may also be noise sources in addition to the actual VDSL signals.

Much more detail about VDSL interference and possible remedies can be found in EMC leaflet 15 which is downloadable from the RSGB website. Later on in this document we suggest that, if you cannot resolve the interference yourself, that you seek advice from the RSGB. In the case of VDSL interference this is especially important since members of the EMC Committee are able to provide specialist help with VDSL interference.

Solar PV: Solar PV installations may be a source of radio frequency interference, typically originating from the electronic converters that transform the DC output from the solar panels to an AC supply. The primary characteristic of this interference is likely to be a wideband signal with repetitive peaks in the frequency domain.

It is likely that the level of interference from a solar PV installation will vary with the instantaneous amount of energy being generated by the solar panels. So looking for variations between day and night, or sunny to dull days, may be a clue as to whether a solar PV installation is a source of interference.

Wind turbines: Wind farms are fast becoming a feature of the British landscape. While they can provide valuable “green” energy, the associated High Voltage Converter Stations have, in some cases, proved to be a significant source of RF interference, primarily in the low frequency HF spectrum. The interference created can sometimes be heard over a very wide area, assisted by the height of the turbines which can act as effective quarter wavelength verticals.

If interference from a wind farm is suspected then look for 100Hz modulated signals, in particular in the 160m or 80m bands, and solicit help from other local amateurs to assist in getting a positive identification of the source. Direction-finding techniques with a directional antenna (e.g. a loop antenna) or a portable receiver may help identify the exact location of the interference.

Wireless charging devices: Increasingly, many devices such as mobile phones use “wireless” inductive charging where a relatively loosely coupled transformer is formed between coils of wire in the phone and the charging base unit.

The primary characteristic of this interference is likely to be a wideband signal with repetitive peaks in the frequency domain. The level of interference is likely to gradually change as the phone charges so this may be indicative of this type of interference. Similarly removing the phone will most probably cause a significant change in the interference, and turning off the charger should remove the interference altogether, so either of these should help to identify the cause of any interference.

The prospect of high-power wireless charging of road vehicles (usually referred to as Wireless Power Transmission or WPT) is threatening yet more interference, potentially at very high levels. The RSGB is actively involved in trying to influence the standardisation process for WPT installations.

TVs: Some flat screen TVs have been known to generate significant broadband RFI, mainly on the lower end of the HF band. The interference can sometimes be reduced using filters on the mains and aerial leads and any other leads that connect signals in or out of the TV, although typically much of the interference is radiated from the screen itself. In the past, some amateurs have been successful in getting the manufactures to replace TVs which have been causing interference, although this must be handled on a case by case basis.

Electric Motors: RFI can occur from both AC and DC electric motors and can take many forms. Its pitch may vary as the motor speed or power varies. These variations can give useful clues about the source. For example, this might be a washing machine or drier, sewing machine, electric lawn mower, food mixer, electric drill, hair dryer or even a model railway. Mains lead filtering can often be effective in reducing the levels of interference.

Overhead Power Cables: Overhead power cables can radiate broad band noise with a distinctive 50Hz or 100Hz modulation. High voltage cables can produce RFI due to corona discharge from the cable itself but RFI can be greatly increased due to arcing at a faulty insulator, particularly in damp weather. Interference from overhead power cables can be notoriously difficult to accurately locate as it may radiate over long distances along the power cable itself.

What can I do to reduce the chances of experiencing RFI?

As a pre-requisite of interference mitigation, it is worthwhile ensuring that “good housekeeping” guidelines are being followed for the installation and operation of the amateur station itself. In particular, as far as possible, aerial feeder cables, shack mains wiring and interconnecting cables between equipment should all be of the minimum possible length. In addition, the earth leads should be as short as possible, and if possible, all the equipment should be earthed at a common point. It is also worth seeing whether separating the radio earth from the mains supply earth (with appropriate mains electrical precautions) reduces the level of induced interference.

Moving the receive antenna as far away as possible from any interference sources is likely to reduce the level of received interference. In particular, since the interference signals drops more rapidly with distance while the antenna is within the “near field” than it does in the transition zone or the far field, moving the antenna far enough away from the interference source to get it out of the near field area will have the most effect. In practice, you should try to separate the antenna and the interference source by at least 1/3 wavelength at the operating frequency.

If the antenna has directional capabilities (which applies to most horizontal antennas such as a horizonal dipole or long wire) installing the antenna with its minimum gain point pointing towards the source of the interference may be beneficial. For example, with a dipole, this could mean stringing the wire so that its long axis points at the interference source.

Using a loop antenna (perhaps just used on receive) may be beneficial since it will tend to be quieter and pick up less interference than a conventional HF antenna. In addition, it has the added bonus that it can be rotated either to maximise the wanted signal or to minimise any interference.

Any directional antenna (such as a beam) can similarly be orientated so as maximise the wanted signal or minimise the interference

Changing from an unbalanced antenna (such as a long wire) to a balanced antenna (such as a dipole) may be beneficial in reducing local interference

With a balanced antenna (such as a dipole) that is being fed via an unbalanced feeder (e.g. co-ax) adding a choke / choking balun at the feed point can significantly reduce common mode currents in the outer conductor, and in doing so may reduce the effects of any locally sourced interference. The balun can consist of nothing more than winding a few turns of the co-ax into a tightly bound coil immediately adjacent to the feed point of the antenna. This is sometimes referred to as an “ugly balun”. Adding a good choke balun to a 'balanced' antenna can often make several S-points difference to the noise level on the lower frequency bands. Alternately, try inserting common mode filters (see RadCom April 2015) or installing a suitable choke balun to minimise unwanted noise pickup. For example, see “High performance common mode chokes” in RadCom Plus Volume 1 No. 1 dated May 2015, or search the internet for G3TXQ ferrite, K9YC ferrite or GM3SEK ferrite.

As a further option, it may be worth trying to see whether a separate receive antenna (located further from the source of the interference than the main antenna) will help to reduce any interference. In particular, using a separate receive loop antenna positioned to point a null at the interference source can be effective.

It is possible to use a phasing noise cancelling signal enhancer which uses a second small antenna (e.g. a short whip antenna) to receive local (primarily interference) signals which are then fed in anti-phase against the signal received by the main antenna to cancel out the local interference. These devices are sold by several well-known amateur radio suppliers and can be very effective, in particular where the interference is caused by just a single source, although they are often complex to set up and require careful retuning every time the frequency is changed. They are more effective against a single interfering source than a proliferation of interfering sources.

All cable runs in the shack should be routed away from each other in order to minimise opportunity for signals to be coupled from one cable to another.

A Google web search will find many designs for the construction of antenna baluns and feed chokes, as well as mains and data cable chokes aimed at minimising the chance of interference being transferred between cables. For example, see http://www.karinya.net/g3txq/chokes/

If you have access to the interfering equipment, it may be possible to eliminate or at least minimise the interference by filtering the mains supply, or using common mode chokes on any cables going in or out of the device. Don't assume that only output ports on a device will radiate interference, input wires can be just as troublesome so, if necessary be prepared to filter all connections in and out of the device. Suitable filters can be made by winding a few turns of the cable onto an appropriately sized ferrite ring. For example, see http://rsgb.org/main/files/2013/10/Filters.pdf

Finally, if it is not possible to reduce the level of locally sourced interference to an acceptable level (especially on particular bands) the only solution may be to use a remotely located receiver station such as a web SDR receiver.

Can we expect to operate free of interference?

The amateur service should, like all other radio services, be entitled to operate free of harmful interference from radio and non-radio electromagnetic emissions that are not supposed to be in our bands. However, as a non-professional service we must accept that we come lower in Ofcom's priorities than resolution of interference to, say, safety of life services, or those who rely on radio for their business.

How can I report interference?

In the first instance, Consider speaking to the "owner" of the interfering equipment. How you approach this will depend on your relationship with that person. It may be that you can resolve the problem with a little cooperation from the person concerned. At the very least you will be able to confirm for sure that you have identified the correct source of the problem (e.g. remove its power source and make sure the interference ceases). But it may be difficult to go beyond that.

Residential properties

If you decide to approach the occupier of a house or flat where you think the source of the interference is, bear in mind that the occupier will probably want to be sure of your identity and your motive before letting you in. It is a good idea to write or telephone first to gain their confidence and arrange a convenient time for a visit. Remember that the source may not actually be where you think it is so you should only say that there *may* be something in the house or flat which is causing interference. Under no circumstances should you *accuse* the householder of causing interference. In most cases, the only way to prove what is causing the RFI is to ask the owner to switch off various electrical equipment until the source is found. In most cases, there is no fault in the equipment in question and only amateur bands are affected. A diplomatic approach is therefore essential as the owner of the equipment is under no obligation to do anything about the RFI so it can only be reduced with their cooperation. Any attempts at reducing the interference should be restricted to measures which can be fitted by the owner without the need for you to touch or dismantle the equipment in question. If the RFI causes interference to broadcast radio or TV reception, then it may also be adversely affecting other neighbours. In such cases, if the owner is unwilling to take any action, the matter can be reported to Ofcom.

Commercial or industrial premises

If the interference appears to be coming from an office, shop, factory or other commercial premises, some effort may be required to contact the right person. In the case of a large company, there is probably an office services manager, building services manager or technical manager whom you could contact. If you are lucky, there may be a licensed radio amateur working on the site somewhere and he or she could be a very useful contact. In any case, it is best to write or telephone first and ask to make an appointment to see the appropriate person. With luck and a diplomatic approach, they may be prepared to take you around the site to look for the source. You will need to take a portable receiver as it may not be possible for equipment to be turned off.

Contacting manufacturers or suppliers
If you can prove conclusively that a certain piece of equipment is producing RFI, it may be worth trying to find out full details of the make, model number and date of purchase so that the matter can be raised directly with the manufacturer or supplier. However, it is strongly recommended that you take advice from the RSGB before approaching anyone. A polite and technically well-informed approach is recommended. The equipment may well have met all the necessary standards at the date of manufacture, so the only way forward would be on a good-will basis.

The best approach when dealing with manufacturers or supplier is usually to phone first and find out the name of the person responsible for EMC then follow up the phone call with a letter or e-mail. It is also worth finding out whether a newer model is available with reduced RFI. In some cases, the manufacturer may be prepared to provide a filter or exchange the equipment in question for a newer model at a reduced price. Members of the EMC committee have experience of various devices that have caused problems in the past, so it will be worth checking with them whether problems have occurred before.

Tell the RSGB of your findings
The RSGB can assist radio amateurs and others who may be affected by problems which occur within the amateur bands, or which develop on other frequencies as a result of amateur transmissions.

Members of the EMC committee have extensive experience in investigating and resolving EMC problems and, depending upon the circumstances, may be able to provide comprehensive advice. Furthermore, the Committee maintains a database of reported EMC problems and this is used to identify trends and other issues for discussion with the relevant regulatory organisations.

Please contact the RSGB by emailing the EMC helpdesk at: helpdesk.emc@rsgb.org.uk

Report the interference to Ofcom
If you cannot resolve the interference, then you can report it to Ofcom. However, before contacting Ofcom, we urge you to seek advice from the RSGB. The RSGB will offer advice and assistance in preparing the information to submit to Ofcom. This must be done in the correct way for it to be recognised as harmful interference.

Recent experience with Ofcom has been mixed, with them only taking effective action in a limited number of cases and being less responsive in others. But it is important that they are made aware of interference even if they are unwilling or unable to resolve the problem.

If your amateur radio apparatus or station is affected by interference, Ofcom may offer you advice and assistance, either on the phone or by email. In some instances, they may agree to investigate interference where there are exceptional circumstances and where they are satisfied that the interference is (i) ‘harmful’, (ii) is outside your control and (iii) that all reasonable steps have been taken to minimise its effects. In addition, they may be prepared to send out a spectrum engineering officer. However, note that you may be liable for the cost of the investigation if Ofcom considers that a source of interference is within your control.

Ofcom will exercise discretion on whether to investigate a report of interference. The regulatory regime does not guarantee that interference will not arise or that enforcement action will be taken to prevent it occurring.

Before reporting interference to Ofcom, and to minimise the risk of incurring Ofcom's costs of undertaking an investigation, you should:

- keep a log of all incidents including the time date and station affected (for at least two weeks);
- establish that the source of harmful interference is not within your control (e.g. within your own house);
- ensure the affected station/apparatus is functioning correctly (e.g. properly installed, maintained and engineered); and
- ensure that all reasonable steps to minimise the interference have been taken.

RSGB EMC Committee
September 2019