

Televisions and TV & radio transmitters

This article is a 'work in progress' incorporating new information whenever time permits.

1. Television sets.

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Televisions and TV and radio transmitters

Television sets

Old-fashioned cathode ray tube (CRT) televisions vary from make to make as to the electromagnetic fields radiated. CRT colour televisions can give off up to 0.5 microtesla (μT) magnetic field levels and 100 volts per metre (V/m) electric field levels at 1 metre distance, and black and white televisions can give off up to 0.2 μT at 1 metre distance.

Magnetic fields travel through walls, so be aware of what is on the other side when placing a CRT television next to a wall. Avoid placing bedheads or 'favourite' chairs in this position as it will expose the sleeper or sitter to unnecessarily high levels of EMFs. Many people have TV sets close to their beds. It is very important to keep them as far as possible, not only for reducing powerfrequency EMFs but also Light at Night, which has an adverse effect on health.

Televisions can give off significant electric fields, due to 'double insulation'. Essentially there is no earth, therefore any excess electricity has nowhere to go easily and can produce strong electric fields. Using an ordinary piece of wire (yellow and green is a recognised colour for earthing wire), connecting the outside of the metal aerial plug to the earth pin of an ordinary 3-pin plug can help. As the television and DVD recorder are usually connected together it is not necessary to earth both units. An alternative which is safer for many people to achieve, is to place all their equipment on a suitable metal stand which is connected to the electricity earth using a wire to the Earth pin of a mains plug. The stand then catches most of the electric fields given off by the equipment.

EMFs from digital TVs are not much different in EMF levels they emit from older analogue models, though some people who suffer from electrical sensitivity (ES) seem to find them worse for reasons we do not yet understand.

Flat-screen LCD TVs (usually those up to about 32 inches (81 cm) diagonal do not generally give off significant EMFs (low- or high-frequency). The most common type are driven by LEDs and are known as TFT displays or LCD/LED displays. They almost always have plastic screens. It is best to have a matte screen rather than a glossy one as unwanted room and light reflections easily cause eye-strain.

Plasma displays are larger. The smallest are 32 inches diagonally and most are larger than this. They work by stimulating special gases and mercury vapour using high-energy electrons that cause them to glow. They have a deeper black than LCD screens, but always have a glass front and so are usually highly reflective to room lights, etc. They are basically equivalent to many, many, thousands of micro-miniature CFLs (compact fluorescent lamps). Some models (if not all models) generate considerable levels of radio-frequency fields that can interfere with nearby electronics and severely affect ES people.

Smart TVs use WiFi. There should be some way of turning off the WiFi, but there may not be for some as their remote handsets are WiFi and not infra-red. You may need to get into the set-up menus, probably only accessible via the remote handset or a connected PC.

It is important to sit at least 1 metre away from the front of the screen. Children often seem to choose to sit closer and should be discouraged from doing so. In [1998](#), Hatch found an increased rate of leukaemia in children watching television. The more they watched, the higher the risk. The risk did not seem to be distance related, so it is likely that there would be other factors than EMFs involved.

Sky TV multiroom system communicates with other television sets using RF at 2.4 GHz. This will add to your RF exposure in the house.

Wireless televisions, which can connect to a set top box or DVD player without any cables, are now available. Ofcom is to release a small part of the radio spectrum, 57-66 GHz, to be used by consumer electronics manufacturers. Panasonic is one of the first companies to sell such appliances.

The set comes with a transmitter, a box the same shape and size as a DVD player. This can sit in a cupboard along with the DVD player and Freeview or Sky box or any other equipment. All the entertainment equipment, including the television aerial, then plug into the transmitter, which sends out a wireless signal to other suitable televisions in the house as long as they are within about 10 metres of the transmitter box. The remote TVs can often control the channel to be watched, etc.

Photosensitive epilepsy is a rare condition, affecting only about 0.04% of the population. It may become more of a problem as televisions have started to produce the frequencies of light which can activate the epileptic fits.

Aerial cable

These can give off significant electric fields if their metal braid is not earthed, so they should be routed away from chairs and beds.

Static electricity

As well as EMFs, televisions generate static electricity. Static electricity attracts fine and superfine aerosol particles. Research from Bristol University shows that these particles can have viruses, bacteria, and carcinogens attached. They may be inhaled into the lung cavities, or may stick to the skin. This is another reason why we recommend that children should sit at a reasonable distance from a TV screen. The static effect persists for some time after the television has been switched off. Use an anti-static cloth to help keep the screen clean.

Remote controls

These days all TV and DVD remote controls work using very low power infrared light and pose no EMF problems.

Satellite dishes and digital TV receptors

They can give off high electric fields if the TV system or satellite decoder is not 'earthed' to the mains electricity safety earth. Most TVs, DVD players and recorders and satellite systems are not earthed when you buy them, as they only have two-wire mains leads. Walls will give some protection from the electric fields; windows are less effective at screening them. People who are electrically sensitive may be affected by electric fields coming in through the windows. It is important that these systems are earthed or, at least, sit on an earthed metal stand.

Digital TV receptors for both satellite and terrestrial signals can be thought of in exactly the same way as satellite dishes and receivers. However, some electrically sensitive people seem to react differently to such signals for reasons which are not yet known. One person we know who is very sensitive indeed, found it easier when she ensured that the television set was between her and the aerial. If she sat between the TV and the aerial, her symptoms were worse.

Digital TV receivers / Digiboxes / Freeview boxes for both satellite and terrestrial signals can be thought of in exactly the same way as satellite dishes and receivers. There is only a subtle

difference in the way the information is coded into the signal. TV reception signals are very small indeed and have no biological effect as far as we know.

TV interference

Some companies, such as Connex South Eastern, the London Underground, and some other rail companies elsewhere in the UK, use Direct Current (DC) electricity to power their trains on their 3-rail systems. This can cause a high magnetic field disturbance when trains draw power (i.e. when the motors are actively pulling). This can affect the colours on CRT televisions in nearby houses (within about 30 metres of the line) - this is a clear indication of a severe magnetic field disturbance which might have long-term health consequences.

People have experienced analogue TV interference from TETRA mobile radio transmitters. This should reduce as the UK is fully converted to digital TV signals only.

Energy use

Ensure that you use the main switch on the set to switch off the television set when it is not in use. Some types of remote control leave your TV on standby and it continues to consume significant energy and is more of a fire hazard.

Cable TV

Occasionally, when cable systems are disconnected, cables are still left live in houses without terminators, causing the continued radiation of the house in question and possibly nearby houses with a high frequency signal. It has been suggested that if anyone does not want their connection to continue, they could cut through the cable on the outside wall of the house and short the inner conductor with the screen. That will shut down that node and any neighbours who are still actively connected will complain to the company who will have to come and remove the 'faulty' connection to the house cable.

Roku Streaming Player

A Roku streaming device gets data (the video stream) via a wired or WiFi connection to an Internet router. One person experienced the following when he used his Acoustimeter. The remote control for the Roku device emits high levels of RF. It works in a similar way to smart meters, transmitting for very short periods of time, but at very high levels. The person who measured these fields said he used to watch films with the Roku remote lying on his chest or next to him on his bed. He said that taking the batteries out of the Roku remote is not a good idea. After a while with no batteries in the Roku remote the Roku base station itself increases its transmission strength to very high levels. If you do want to take the batteries out of the remote, unplug the power cord for the Roku device itself.

Recommendations

- Clean TV screens with an anti-static cloth reasonably frequently, as the electric fields cause a build up of static which attract pollutant particles to the screen
- Children should sit at a reasonable distance (at least a metre) from a TV screen to avoid inhaling any particles adhering to it as a result of the static electric fields referred to above.
- Ensure that you use the main switch on the set to switch off the television set. Some types of remote control leave your TV on standby and it continues to consume considerable energy and is more of a fire-hazard. Some people find it easiest to run all their TV and

home entertainment equipment from a single multiway extension cable which can then be switched fully off by using just one main socket wall switch.

- Keep all electrical equipment, clock radios, televisions, etc at least a metre away from the head of the nearest person.
- You may want to ensure that the TV set is between you and the aerial, if you feel it may be affecting you.

TV and radio transmitters

Stanislav Szmigielski (1996) monitored the Polish military personnel for over 15 years and found that those occupationally exposed to RF and microwave radiation were 14 times more likely to develop chronic leukaemia in their old age, 9 times more likely to develop acute leukaemia and 6 times more likely to develop Non-Hodgkin's Lymphoma (NHL). NHL incidence is rising steadily in Western countries for no known reason. The estimated average exposure levels of the people in Szmigielski's study were only about 5 microwatts per square centimetre, a level which can be found near powerful cellular phone base-stations and main TV and radio transmitter masts.

Results of exposure to RF from a study by Osei (2015) of 2 TV stations in Accra were generally found to be below the occupational reference levels of the International Commission on Non-Ionizing Radiation Protection, but at some locations, the field intensity was 4.3 times higher than the reference levels for the general public.

It has been suggested by industry that living near to TV and radio transmitters is perfectly safe. Some studies have linked proximity to an increased risk of ill health, including leukaemia (Hocking 1996, Dolk 1997, Ha 2003, 2007) brain tumours (Reif 2005), melanoma (Hallberg & Johansson 2002, 2004) and other cancers (Park 2004). A Swiss radio transmitter was shut down, and a 'before and after' study (Altpeter 2006) revealed that the transmissions affected melatonin levels and sleep.

The reason for these health problems is still unknown, but it may well have been a combination of microwave radiation and possible cancer-causing chemicals in the air.

Increasing proximity to radio and TV transmitters, elevation, and line-of-sight visibility were each associated with elevated RF exposures (Burch 2006). At average distances from more than 1-3 km, exterior RF measurements were 13-30 times greater among homes that had more than 50% of the transmitters visible compared with homes with 50% visibility or less at those distances.

Radiofrequency and microwave signals will increase over the next few years with the phasing out of analogue TV signals (600-800 Mhz) and their replacement with digital ones at similar frequencies. The digital transmissions will initially be at quite low power. The digital pulse gaps have 'fill-in' transmissions, which makes the signal less pulsed. It is possible that there is some sort of 'neutralising' effect of the combination of digital and analogue signals from the same transmitter, as when the analogue signals are switched off, and the digital power is increased, more people seem to experience ill-health symptoms. However, it may be simply the increase in power when the digital transmission comes fully on line.

The sale of the frequencies freed up by the switchover provides the bandwidth for data services following the exponential rise of smartphones. The spectrum being auctioned is particularly valuable because it is lower frequency, therefore the signals cover greater distances and penetrate building materials better, allowing consumers to use their smartphones to surf the web at home.

In Germany, in 2006, 2 digital TV transmitters went online in an area that had had rather low mobile phone mast exposure levels. Within a radius of 20 km, the following symptoms that occurred abruptly were reported: constant headaches, pressure in the head, drowsiness, sleep

problems, inability to think clearly, forgetfulness, nervous tension, irritability, tightness in the chest, rapid heartbeat, shortness of breath, depressed mood, total apathy, loss of empathy, burning skin, inner burning, leg weakness, pain in the limbs, stabbing pains in various organs, weight gain. Birds had fled the area, cats hardly ever went into the garden. One child committed suicide; another attempted it. Doctors went with affected people to areas where there was no digital TV reception and witnessed how they became symptom-free after a short period of time.

There is something about digital signals that make them more damaging even at very low signal strengths, probably because it is all transmitted at the same amplitude. This means that the signals fall for relatively long periods within the amplitude window for calcium release of at least some individual living cells and all that may stem from it (e.g. ES, DNA damage, cancer, etc.). It also may be why normal amplitude modulated transmissions have relatively little biological effect; because their modulation follows an irregular pattern, they do not stay long enough within the amplitude window of any cell to produce an effect. Adding an irregular (random) signal to a digital signal can reduce its biological effect, which explains why the analogue and digital signals being transmitted at the same time were less biologically active. The problems arise when the analogue signal is switched off.

A pilot study in Turkey that had a hill near a residential community with a multiple-transmitter site hosting 64 different TV and radio towers, found the calculated radiation level in the region was found to be approximately four times higher than the permitted standards of Turkey, which are the same as the ICNIRP standards (Sirav & Seyhan [2009](#)). It is difficult to believe that this level would be found and it is a pity that no actual measurements were taken. However, it does highlight the problem that neither in the UK are regular audits of exposure levels made, neither is there a process to address excessive values if found.

The switchover to digital radio should be completed by 2020. Meanwhile the Digital Radio Working Group said (2008) that all national, regional and large local radio stations should switch to DAB in the medium term, while small local and community stations would continue to broadcast on FM. Car manufacturers will have to be persuaded to install digital radios as standard.

References

Altpeter ES et al 2006 - *Effect of short-wave (6-22 MHz) magnetic fields on sleep quality and melatonin cycle in humans: the Schwarzenburg shut-down study* Bioelectromagnetics 27(2):142-50 PMID: 16342198

Burch JB et al 2006 - *Radio frequency nonionizing radiation in a community exposed to radio and television broadcasting* Environ Health Perspect 114(2):248-253 PMID: 16451862

Dolk H et al 1997 - *Cancer Incidence near Radio & TV Transmitters in Great Britain. I. Sutton Coldfield transmitter* American Journal of Epidemiology 145(1): 1- 9 PMID: 8982016

Dolk H et al 1997 - *Cancer Incidence near Radio & TV Transmitters in Great Britain. II. All high power transmitters* American Journal of Epidemiology 145(1): 10-17 PMID: 8982017

Ha M et al 2007 - *Radio-frequency radiation exposure from AM radio transmitters and childhood leukemia and brain cancer* Am J Epidemiol 166(3):270-9 PMID: 17556764

Ha M et al 2003 - *Incidence of cancer in the vicinity of Korean AM radio transmitters* Arch Environ Health 58(12):756-62 PMID: 15859510

Hallberg O & O Johansson 2004 - *Malignant melanoma of the skin - not a sunshine story!* Med Sci Monit 10(7):CR336-40 PMID: 15232509

Hallberg O & O Johansson 2002 - *Melanoma incidence and frequency modulation (FM) broadcasting* Arch Environ Health 57(1):32-40 PMID: 12071358

Hatch EE et al 1998 - *Association between childhood acute lymphoblastic leukemia and use of electrical appliances during pregnancy and childhood* Epidemiology 9(3):234-45 PMID: 9583414

Hocking B et al 1996 - *Cancer incidence and mortality and proximity to TV towers* Med J Aust 165(11-12):601-5

Osei S et al 2015 - *Assessment of levels of occupational exposure to workers in radiofrequency fields of two television stations in Accra, Ghana* Radiat Prot Dosimetry May 15 [Epub ahead of print] PMID: 25979743

Park SK et al 2004 - *Ecological study on residences in the vicinity of AM radio broadcasting towers and cancer death: preliminary observations in Korea* Int Arch Occup Environ Health 77(6):387-94 PMID: 15338224

Reif JS et al 2005 - *Human Responses to Residential RF Exposure* Final report 2 ROI ES008117-04

Sirav B & N Seyhan 2009 - *Radio frequency radiation (RFR) from TV and radio transmitters at a pilot region in Turkey* Radiat Prot Dosimetry 136(2):114-7 PMID: 19671591

Szmigielski S 1996 - *Cancer morbidity in subjects occupationally exposed to high frequency (radiofrequency and microwave) electromagnetic radiation* Sci Total Environ 180(1): 9-17 PMID: 8717316