

# Safety in the vicinity of high frequency roof antennas

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**The rapid growth of mobile communications has not only led to a rising number of mobile telephones. The high frequency antennas essential for these services are now also widespread on many building roofs. However, not everyone is aware that working close to these sources of high frequency electromagnetic radiation, such as transmitter antennas for mobile phones, pagers and police, fire and other emergency services, can pose a danger.**



Many bodies such as the authorities with responsibility for workplace safety and the environment or the World Health Organisation (WHO) are studying this high frequency radiation, also known as electrosmog or artificially created electromagnetic energy. Several national and international research projects are currently attempting to determine the effects of high frequency radiation, which is a type of non-ionising radiation, on human health. The existing national and international regulations for protection of the general population and the people who work in close proximity to high frequency antennas confirm the enormous importance of the topic of "safety in electromagnetic fields".

So far, the research in this area has not provided any clear results about the extent of the actual danger. However, the thermal effects of high frequency fields have been scientifically proven and recognised: the high frequency radiation is absorbed by the human body and above a certain field strength this leads to a warming of the body from the inside out. The level of absorption of the electromagnetic waves varies according to the frequency, field strength and the type of tissue. Parts of the body with a low bloodflow are in particular danger, e.g. the lenses of the eye, because the heat created is not transported away efficiently. A warming of the body by electromagnetic energy either cannot be observed or can only be observed with a considerable delay and therefore poses a health risk. For this reason, threshold values for high frequency electromagnetic radiation are determined on the basis of this warming effect on the body.

Generally, the level of exposure to artificially created electromagnetic energy depends on the type

and direction of the antenna: dipole antennas, such as those used for pager services, can produce much higher field strengths in their direct vicinity than sector antennas for a mobile phone service which usually operates with a much lower transmitter power. At distances greater than 4.5 - 6 metres, current research has determined no danger for humans as the maximum threshold values are not exceeded by the most powerful transmitters for mobile communications. However, as the distance to the antenna is reduced below this, the exposure values rise quickly. The basic rule of thumb states that the dose is four times higher when you halve your distance to the antenna. This means that if you are only a quarter of the recommended safe distance away, the degree of exposure is sixteen times higher. At one tenth of the distance, the dose is even 100 times greater.

The number of antenna systems on house roofs has risen drastically with the explosive development of mobile communication services in recent years. A new UMTS mobile phone network is planned to be launched in Europe in stages. This will make it possible to use multimedia functions through mobile phones and will provide even greater impetus to the mobile phone industry. Although the transmitters for the third generation of the mobile communication standard will operate with much lower power output than radio or television broadcasts, the radiation levels should still be checked whenever people spend time close to them.

With this in mind, protective measures for the owners and administrators of affected buildings take on an even greater importance. The dangers posed to people who access these roofs or areas close to antennas, whether with or without permission, must be minimised. It is easy to prevent access to antenna installations on towers. However, it is considerably more difficult to restrict access to installations on the roofs of buildings as a number of personnel all require regular access to roof areas, e.g. house technicians, administrators, servicing personnel for air-conditioning systems and elevators, roofers, chimney sweeps, decorators and cleaners. For most of these people, the topic of electromagnetic fields is completely new and they have either no or very little understanding of the subject. Roofs with several transmitter antennas are particularly important as the levels of threshold values may not simply vary, they may also be exceeded more quickly. The risk of exceeding the threshold values is exceptionally high in these areas.

The solution here lies in training, good equipment and modern measurement technology. Thanks to these latest developments people with very little experience can make quick and easy measurements to protect themselves effectively –



even in complex environments such as building roofs with a variety of different services (mobile phone or pager antennas, VHF, radio or TV). These measurement techniques take account of the different threshold values for electromagnetic fields which vary according to the frequency and the absorption characteristics of the human body. The user therefore receives a reliable result in percent of specified standards that requires no interpretation and does not have to know the frequencies and their corresponding field strength threshold values.

A few simple procedures allow building owners and administrators to guarantee safety in the electromagnetic fields created on their roof or property. The following section gives practical suggestions for protecting people against the dangers presented by electromagnetic fields. It makes the complex subject of EMF simpler to understand and suggests the appropriate safety measures to be implemented. The most important elements for these measures are:

**1. Instruction.** The aim of instruction is to inform the affected personnel about the sources and dangers of electromagnetic fields as well as about the correct protective measures and behaviours. These training measures should be repeated regularly and participation should be documented. In addition, the training should include instruction on the correct methods for using the measurement technology. This prevents mistakes which could lead to inaccurate results and therefore put personnel in direct danger.



## 2. Equipment for personnel protection.

While working in close proximity to electromagnetic radiation, normal protective clothing for the particular situation (protective boots, helmet, gloves etc.) must be supplemented with a field monitor worn on the body or, in extreme cases, a conductive suit. Field monitors are easy to use and can evaluate field strengths according to corresponding legal threshold values. If a person enters an area where the field strengths are close to or in excess of the threshold value, the user is alerted by optical and acoustic or vibrating warning signals.

**3. Determining and evaluating possible areas.** As well as determining the exposure areas using measurements and simulations, electromagnetic fields should also be calculated and compared with the legally required or recommended threshold values.

**4. Marking and controlling danger areas.** Once potential danger zones have been identified by appropriate measurements, they must be clearly marked. This must be done by notices with the appropriate symbols and, if necessary, by physical barriers such as chains or fences.

**5. Documentation.** It is essential to document results correctly so they can be tested by independent authorities and compared with

subsequent measurements, e.g. after an additional transmitter has been installed or when a particular deadline has expired.

Further background material and information about standards, threshold values and implementation regulations for safety in electromagnetic fields as well as useful links can be found at [www.narda-sts.de](http://www.narda-sts.de).

### Other important internet links:

**National Radiological Protection Board (NRPB)**

[www.nrpb.org.uk](http://www.nrpb.org.uk)

**World Health Organisation (WHO EMF Project)**

[www.who.int/peh-emf/](http://www.who.int/peh-emf/)

**International Commission on Non-Ionising Radiation Protection (ICNIRP)**

[www.icnirp.de](http://www.icnirp.de)

High frequency radiation falls under the category of electromagnetic fields (EMF) and cannot be compared directly with ionising radiation which is created in x-ray procedures and by radioactive decay. Electromagnetic fields can be divided into low frequency (alternating fields up to 30 kHz) and high frequency (alternating fields between 30 kHz - 300 GHz). Diagram 1 shows the complete

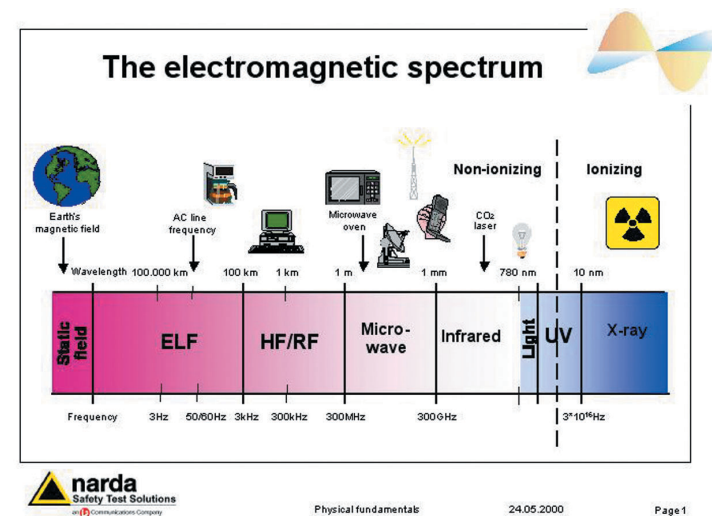


Diagram 1: The complete electromagnetic spectrum

electromagnetic spectrum from static magnetic fields to ionising radiation.

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